ELECTRICAL WIRING

MEMO

TO: Southern California Appliance Dealers

the attached newspaper ads are part of the Edison Company's campaign to help you sell more lighting equipment

Reddy Kilowatt

There's no place like Home

"Pardon me, I'm looking for an extra bulb"

"Bulbs—oh swell, now we can stay up after dark"

FILL EMPTY SOCKETS

REPLACE DIM BULBS

KEEP A SUPPLY OF LIGHT BULBS ON HAND

SOUTHERN CALIFORNIA EDISON COMPANY

SOUTHERN CALIFORNIA Edison

ELECTRICAL WEST (with which is consolidated The Journal of Electricity), November, 1946. Vol. 97, No. 5. Published monthly by the McGraw-Hill Company of California, 68 Post Street, San Francisco 4, Calif. Entered as second class matter at the post office at San Francisco under the Act of March 3, 1879. Additional entry as second class matter at the post office at Los Angeles. Printed in U. S. A. Subscription rates—U. S., U. S. Possessions and Latin American Republics: $2, 1 year; $3, 2 years; $4, 3 years. Canada: $2.50, 1 year; $4, 2 years; $5, 3 years. Other countries: $3, 1 year; $5, 2 years; $6, 3 years. Single copy, 25c.

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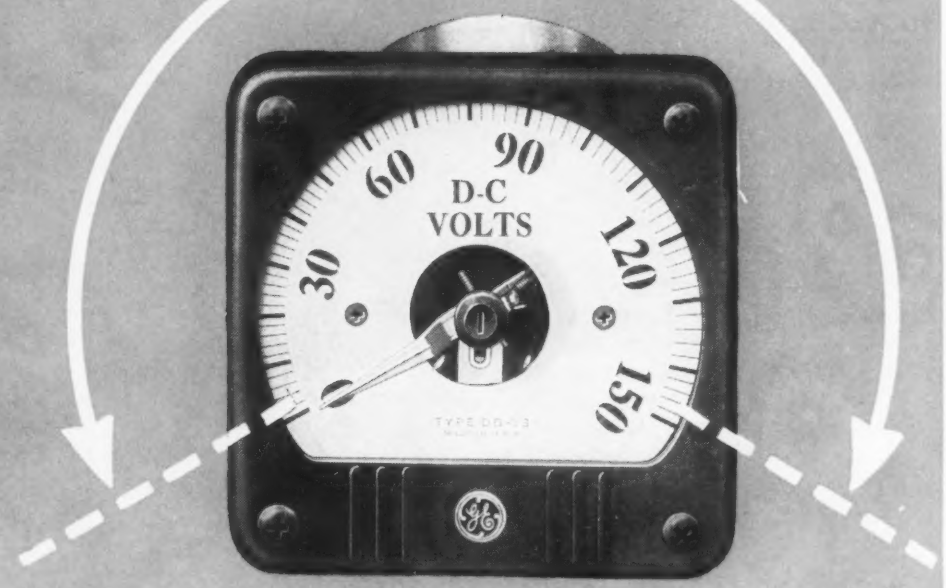
a 4 1/4" instrument with a 7" scale



TYPES

AB-13—A-C

DB-13—D-C

VOLTMETERS
A-C & D-C

AMMETERS
A-C & D-C

WATTMETERS

VARMETERS

POWER-FACTOR METERS

SYNCHROSCOPES

FREQUENCY METERS

ALSO

Temperature Meters

Tachometers

Easy to read—accurately

Concentric-scale instruments mean a 36 per cent longer scale in 40 per cent of the panel space—for that is the comparison between the G-E long-scale, 4¼-inch switchboard instrument and the conventional-scale, six-inch rectangular, semiflush switchboard instrument. Here is what the long (7-inch) scale, spanning 240 degrees, means to you:

For voltage—The extra length permits more precise control of station bus voltage. See how easy it is to read to one volt on the scale.

For current—Readings can be taken from full scale down to approximately 10 per cent of this value, thus extending the useful range.

For power—Wattmeters and varmeters not only have long scales, but the divisions are evenly spaced throughout—an added advantage contributing to more accurate readings.

For frequency—The 7-inch scale, calibrated 55-65 cycles, permits closer readings; more precise control.

For temperature—The scale, nearly twice as long as usual, permits closer watch over critical heating.

Other accuracy features—One per-cent accuracy rating, thorough shielding, antiparallax scale and pointer, and non-glare glass.

Insist on G-E concentric-scale instruments for all new installations. Write your nearest G-E sales office for Bulletin GEA-3432. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

HEADQUARTERS FOR MEASUREMENTS

GENERAL ELECTRIC

ELECTRICAL WEST

VOL. 97 NOVEMBER 1946 NO. 5

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Cover Photo: The attractive store of George G. Geddes Hollywood Electric Co., making the best use of scarce merchandise, typifies stores throughout the West preparing for a Christmas season again without all the wares their customers would eagerly buy

CHANGE OF ADDRESS

Circulation Manager,
Electrical West,
68 Post St.
San Francisco, Calif.

Please change my address

From .....

To .....

Signed .....

This Month

Scientists

Along with the *Prospectus on Atomic Power*, page 55, is a statement concerning its authorship. Among the important contributors is the Northern California Association of Scientists.

This is an impressive name, and there are impressive names on its executive committee—well known scientists from the University of California and industrial research groups. But its growing membership extends to anyone with training or experience equivalent to a Bachelor's degree in engineering, mathematics or natural science.

The association is less than a year old and is one of many regional groups which together constitute the Federation of American Scientists. It started as one of the spontaneous organizations that formed to direct a coordinated, collective effort toward preventing atomic war. To this end it is centering its activities around the dissemination of information, and education which will influence national legislation and international control.

The paper published here serves the association's main purpose only indirectly, as it deals strictly with nonpolitical aspects of power production.

The association now has more than 500 members. Its headquarters are at the International Center, 68 Post St., San Francisco.

Merchandising

Begun this month, the Appliance and Sales Section is to be grouped so that dealers may more readily find it. In it are all the sales news, sales features, the News-Letter and the Sales Guide, all the new product announcements that deal with things that dealers may want to sell, and also the advertising of appliance lines. It is almost a magazine within a magazine, and the front cover will tell dealers and distributors what page to turn to for the information of particular interest to them. The section will be for the sales minded and the dealers—told quickly, briefly, but with the facts that dealers want to know. Watch this section grow.

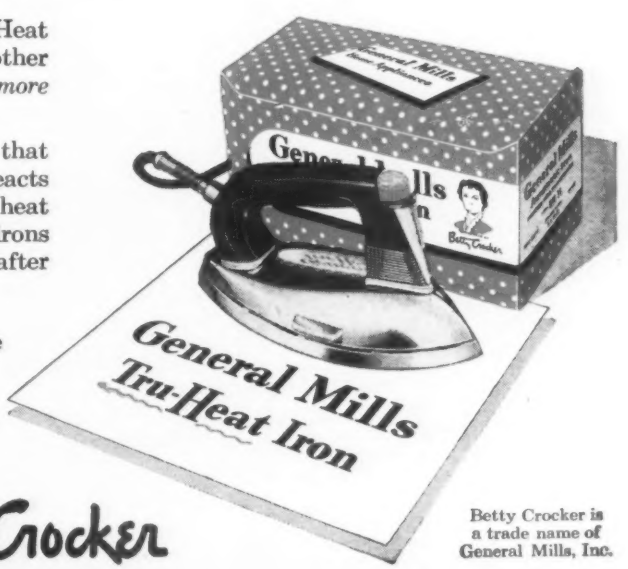
4-WAY FULL-VUE SOLEPLATE means easier ironing! The taper-rounded back of the General Mills Tru-Heat Iron noses handily into hard-to-get-at places . . . doesn't bunch up material on the back stroke—lets the iron glide effortlessly in any direction — gives ironers an unobstructed view of their work, back and front!

Covers more ironing at every stroke!

It's *big!* The ironing surface of the General Mills Tru-Heat Iron is 15.7% *larger*, 28% *longer*, than the average of five other leading irons—larger than any of them. Every stroke *does more ironing* . . . and does it easier!

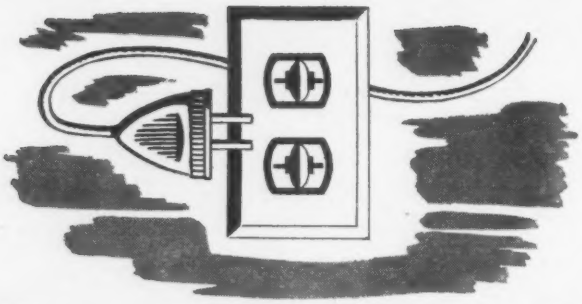
But there's more to the story. There's the *Safety Side Rest* that ends tiresome lifting . . . there's *Tru-Heat Control*, that reacts faster to temperature changes than ordinary types of iron heat regulators . . . there's the new all-around *Button Bevel* that irons under buttons with any part of the iron edge. There's feature after feature to make ironing—*and selling*—easier and faster.

NOW BEING DISTRIBUTED IN: Minnesota, Nebraska, the Dakotas, Wisconsin, Iowa, Michigan, Indiana, Montana, Wyoming, Utah, Colorado, New Mexico, and parts of Idaho, Illinois, Kentucky, Ohio and West Virginia. Other states to follow soon! General Mills, Inc., Home Appliance Department, Minneapolis 13, Minnesota.



THE IRON SPONSORED BY Betty Crocker

Betty Crocker is a trade name of General Mills, Inc.



ELECTRICAL INDUSTRY

Served by

UNION PACIFIC

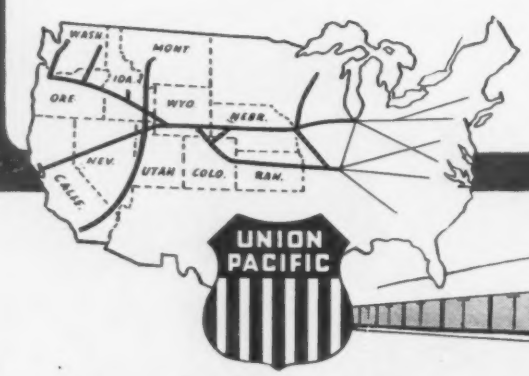
Your industry is one of hundreds served by Union Pacific. Every shipper is assured of efficient, dependable transportation when materials or merchandise are earmarked for the Strategic Middle Route, uniting the East with the Midwest, Intermountain, and Pacific Coast States.

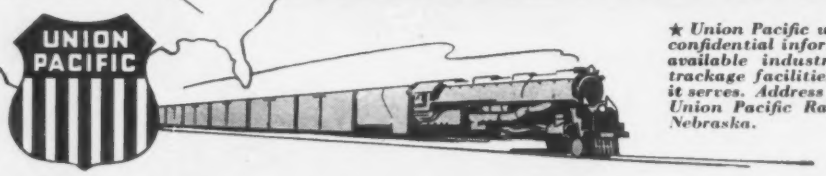
Union Pacific provides specifically designed cars, various services and departments, to assure proper handling of a wide diversity of products.

Union Pacific's facilities and equipment are ready to meet the heaviest needs of commerce. Traffic experts are stationed from coast-to-coast. They will help you with that *next* shipment—and every shipment.

For dependable, fast freight service always . . .

be Specific –
say "Union Pacific"





★ *Union Pacific will gladly furnish confidential information regarding available industrial sites having trackage facilities in the territory it serves. Address Industrial Dept., Union Pacific Railroad, Omaha 2, Nebraska.*

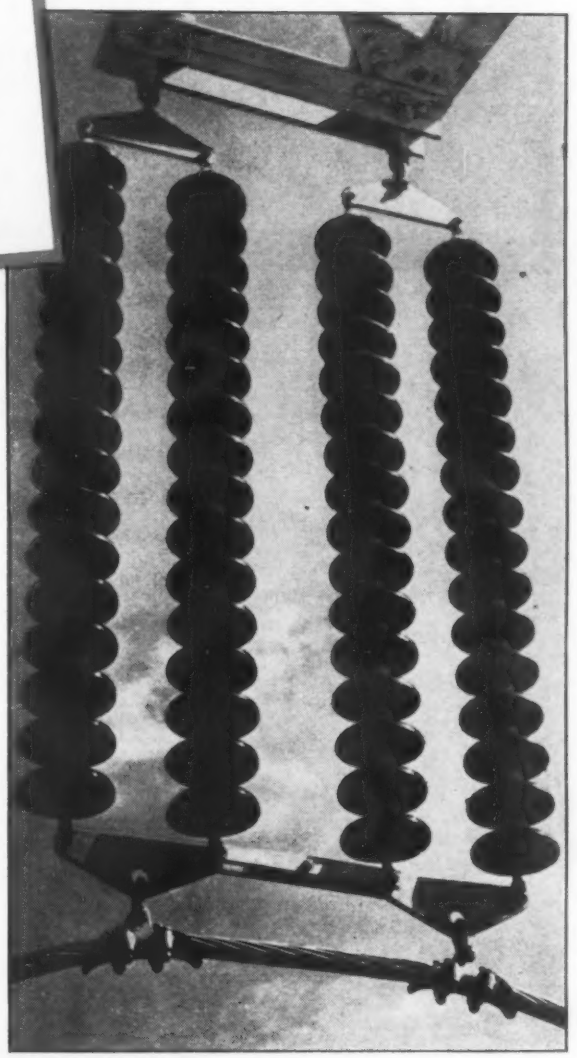
UNION PACIFIC RAILROAD

The Strategic Middle Route

IN WIND, RAIN, SNOW OR HAIL • YOUR FREIGHT GETS THERE BY RAIL!

FOR TRANSMISSION LINE DESIGN USE BTC STANDARD DROP FORGED STEEL LINE HARDWARE

For Special Construction Requirements



For out-of-the ordinary construction, it is imperative under existing conditions to utilize a minimum of special parts, particularly those involving new production tooling.

A long, high river crossing in the Northwest called for very high strength conductor suspensions on riverbank towers with dead-ending on adjacent inland towers.

The B. T. C. Suspension Assembly, as illustrated, solved the problem.

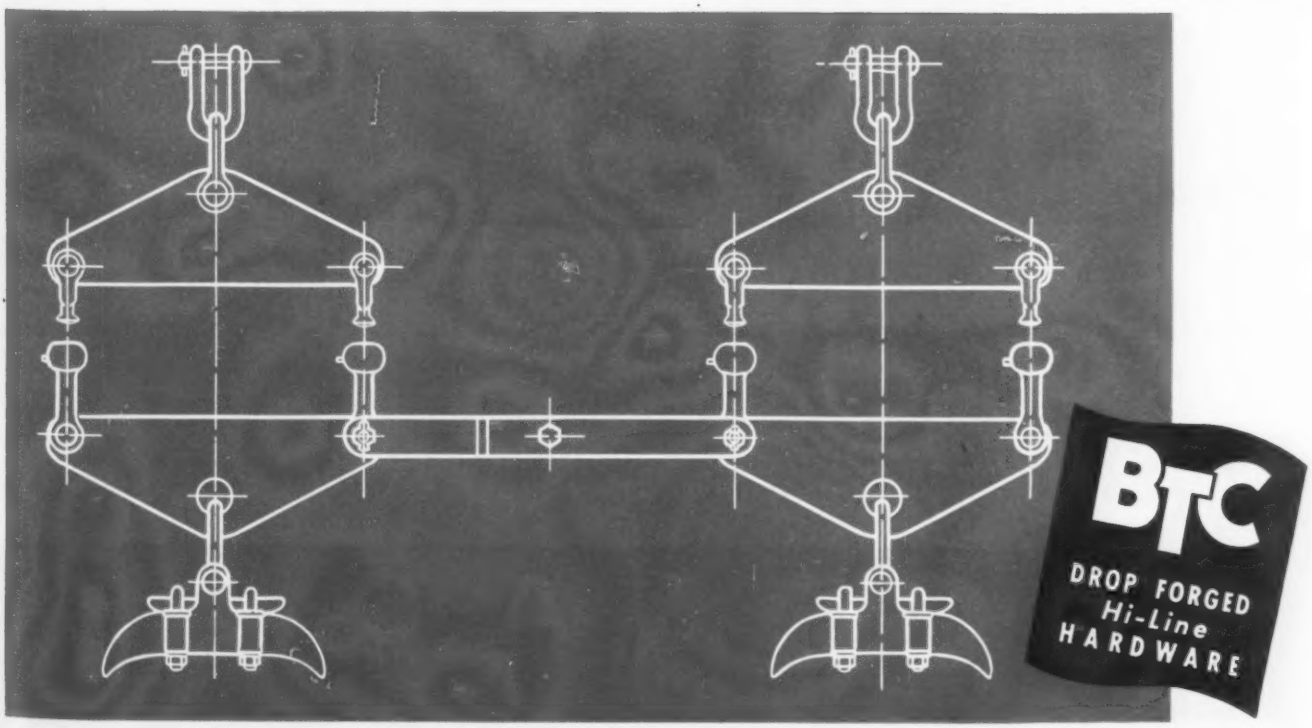
Only ONE SPECIAL PART was used—a simple steel strap, two of which maintained the lower Yoke spacing.

Forged Steel Yoke Plates, Connecting Fittings and Clamps were produced in standard dies—the Lower Plates with large apex holes to accommodate the Shackle Clevises in the desired flexible, length-saving position; and the Clamps heat-treated for added strength.

The use of Drop Forged Steel Line Hardware allows considerable flexibility of design—Standard parts may be machined or hot-formed to special dimensions without sacrificing essential strength; or heat-treated to increase their inherent strength and resistance to shock and fatigue.

Sold only through your insulator manufacturer

THE BREWER-TITCHENER CORPORATION
CORTLAND, NEW YORK



PARDON ME FOR POINTING..

but, when you see me on the job, they're building a REAL power line

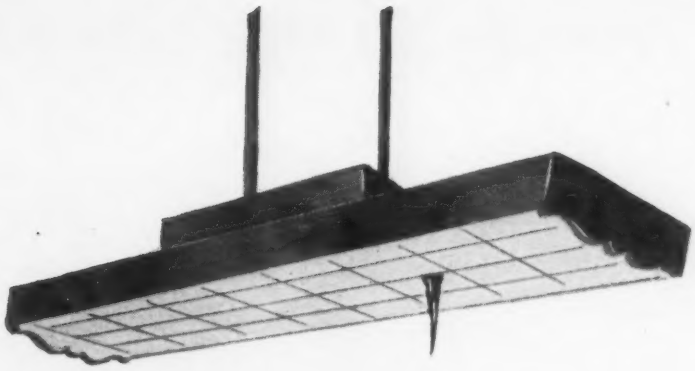
I'm the Alcoa cable reel—the package on which A.C.S.R., made by Aluminum Company of America, is delivered to the job. I stand for Quality.

Alcoa's been making Aluminum Cable Steel Reinforced ever since 1909, and they were in the aluminum cable business long before that. So the power cable you buy from Alcoa, the engineering advice, the erection supervision, all have a history of service behind them.

Profit by this background. Specify Alcoa A.C.S.R. for your lines. ALUMINUM COMPANY OF AMERICA. 2132 Gulf Building, Pittsburgh 19, Pennsylvania. Sales offices in principal cities.

ALCOA A·C·S·R

ALUMINUM CABLE STEEL REINFORCED



IS THIS *DRIP** NECESSARY?

***Prevent it . . . with* CERTIFIED BALLASTS**

People in the lighting business . . . and some unfortunate users . . . know that this trouble comes from an improperly installed, *overheated* ballast in a fluorescent lighting fixture.

Protection against overheating is only one result of the many rigid manufacturing specifications under which CERTIFIED BALLASTS are built. They are tested, checked and *Certified* as meeting these specifications by impartial experts, Electrical Testing Laboratories, Inc. That means assurance of good lamp performance, good fixture operation and minimum service worries.

CERTIFIED BALLASTS, properly installed, will not drip—will normally outlast the entire lighting installation . . . and they cost no more than any other ballasts. So why not be sure? Look for the ETL Certification mark on the equipment you specify.

CERTIFIED
E·T·L·
SPEC. NO. 6
HIGH PF

*The compound inside a ballast, used to deaden sound and hold parts in place, melts under excessive temperatures.

Certified Ballast Manufacturers

Makers of Certified Ballasts for Fluorescent Lighting Fixtures

Acme Electric Corporation
Cuba, New York

Chicago Transformer Div.
Essex Wire Corporation
3501 Addison St., Chicago, Illinois

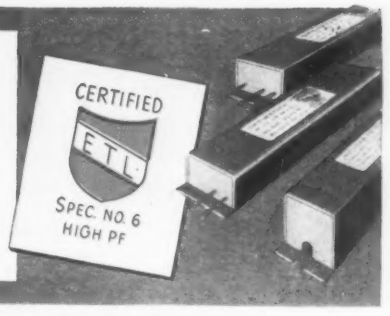
General Electric Co.
Specialty Transformer Division
Fort Wayne, Ind.

Jefferson Electric Co.
Bellwood, Illinois

Sola Electric Co.
2525 Clybourn Avenue
Chicago 14, Illinois

Starring and Company
Bridgeport, Conn.

Wheeler Insulated Wire Co., 378 Washington Ave., Bridgeport, Conn.



IN THE PALM OF YOUR HAND
answers to Varnish Problems

You can use your free copy of this big catalog in finding the exact varnish for nearly every requirement. It's filled with helpful information and descriptions of many different Pedigree Varnishes, each a favorite because of its outstanding performance. If your requirements necessitate the formulation of a special varnish, the Pedigree Industrial Laboratory is at your disposal.

Pedigree Varnishes

Send for your FREE copy today.

Distributed by

INSULATION MANUFACTURERS CORPORATION

INSULATION AND WIRES INCORPORATED

TRI-STATE SUPPLY CORPORATION

Manufactured by

THE P. D. GEORGE COMPANY, ST. LOUIS, U. S. A.

GEORGE COMPANY, SPRINT LOGISTICS

What Do You Want in Switchgear?

MOST OPERATORS TODAY ARE LOOKING FOR 3 BIG THINGS IN MODERN METAL-CLAD SWITCHGEAR — SAFETY, LOW MAINTENANCE, AND EASY INSTALLATION!

YES, Allis-Chalmers metal-clad switchgear gives you the three things most important to the average operator — through the features of advanced design outlined at right.

Equipped with magnetic air, oil, or air blast circuit breakers, Allis-Chalmers metal-clad switchgear is adapted to every industry and utility application, indoor or outdoor!

You'll like the fact that circuit breaker units are interchangeable for same rating and type of breaker . . . and saving of aisle space by compact vertical lift construction. It all adds up to your greater convenience!

Get full details on metal-clad, vertical lift switchgear by contacting our nearby sales office. Or write directly to ALLIS-CHALMERS, MILWAUKEE 1, WIS.

☑ **Want Simple Installation?** You'll get it with completely factory-built, wired and assembled Allis-Chalmers switchgear units . . . easy to install, and more units can be added in the future without trouble. Lining up just four points — not eight — saves installation time!

☑ **Want Easy Maintenance?** Note these Allis-Chalmers metal-clad switchgear details: Removable plates for access to bus and instrument transformer compartments, circuit breaker, and secondary wiring; "hinged" wiring connection eliminates wear or bending on wires when door is opened or closed; special method of insulating busbars does away with using compound filling for bus joints.

☑ **Want Safe Operation?** You get that, too, when you specify Allis-Chalmers switchgear. Isolation of units, *fully automatic* disconnect shutters, and positive interlocks on elevating mechanism are a few of the details adding up to *safety* for operators!

A 2076

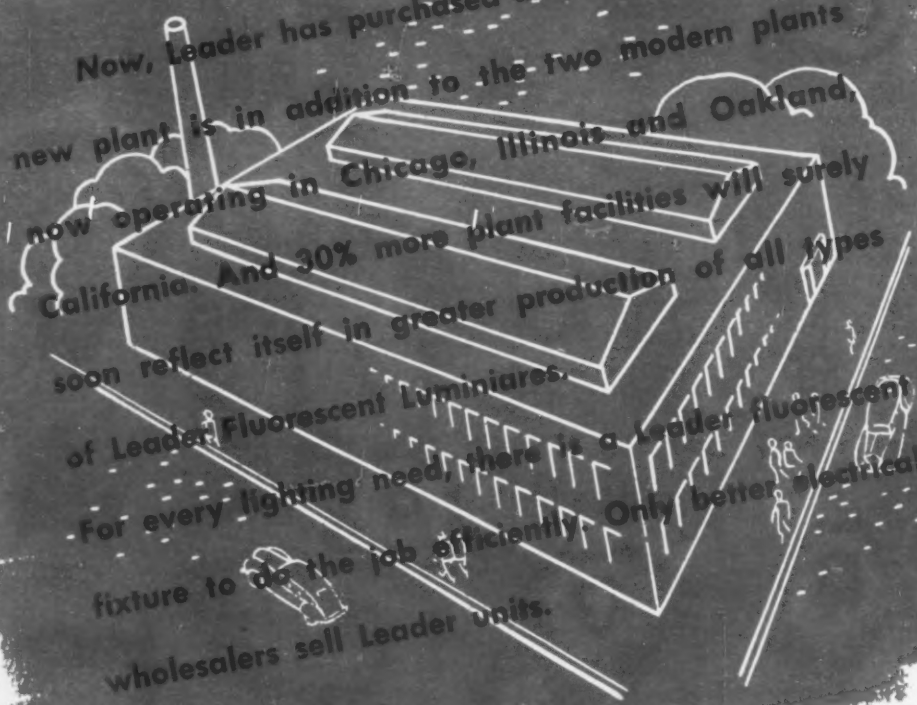
ALLIS-CHALMERS

One of the Big 3 in Electric Power Equipment — Biggest of All in Range of Industrial Products

METAL-CLAD *Switchgear*

Leader announces

30% more plant facilities



Now, Leader has purchased another factory! This new plant is in addition to the two modern plants now operating in Chicago, Illinois and Oakland, California. And 30% more plant facilities will surely soon reflect itself in greater production of all types of Leader Fluorescent Luminiares.

For every lighting need, there is a Leader fluorescent fixture to do the job efficiently. Only better electrical wholesalers sell Leader units.

There is a friendly Leader representative in your area. See him today, or write

LEADER ELECTRIC MANUFACTURING CORP., 6127 N. BROADWAY, CHICAGO 4

WEST COAST FACTORY
2040 LIVINGSTON ST., OAKLAND 6, CALIF.

Sherman Split Bolt Connectors

Full hexagon head of generous size — six big, flat surfaces for wrench jaws to grip at any angle. A real aid to fast, easy, tight assembly.

●

No sharp edges or corners to cut hands or tear lineman's rubber gloves.

●

Die cut threads (not pressed or stamped) checked with precision gauges to mate perfectly with tapped threads in nut.

●

Solid reinforced spacer — won't distort or collapse and allow threads to strip. Also provides maximum bearing surface on wire with minimum friction on nut.

●

Body machined from No. 3 (free cutting) silicon bronze. Nut is coined from No. 1 silicon bronze. Both alloys average over 90,000 lb. tensile strength per square inch.

●

Extra thick nut, provides more threads and greater bearing surface — permits greater leverage in tightening.

●

Extra long pilot — makes it easier to start the nut.

●

Made in full range of sizes from No. 10 to 1,000 MCM wire, including extra length connectors which will take three wires.

●

Sizes from No. 6 through No. 1/0 can be furnished with non-tangling bead chain nut retainer.

●

All connectors clearly stamped on the head with the trade name, "Sherman," as well as the catalog number and wire size. Packed in sturdy metal edge cartons plainly labeled.

Split Bolt Connectors, to be considered satisfactory today, must measure up to extremely high standards.

These connectors must take considerable punishment, both in installation and in normal service. They are under a continuous strain, yet they must maintain a tight, permanent joint, since any failure of the connector means an interruption in service, coupled with extra work for the service men.

Sherman Split Bolt Connectors are not only made to meet all these requirements, but are also designed to facilitate quick, easy installation. We sincerely believe that there are few other connectors on the market today that can approach Sherman quality.

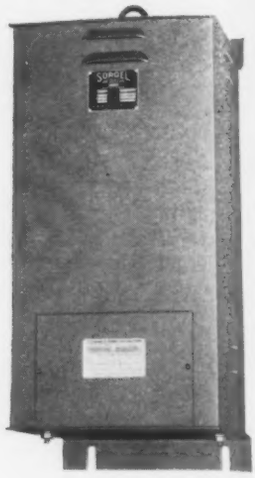
At left are shown some of the outstanding features of these Sherman Split Bolt Connectors. We strongly recommend an earnest consideration of these features by every engineer concerned with specifying connectors of this type.

50 YEARS 1896 S 1946 OF LEADERSHIP

H. B. SHERMAN MFG. CO., BATTLE CREEK, MICH.

SORGEL AIR-COOLED TRANSFORMERS

¼ KVA
Single Phase
460/230 to
115 volt



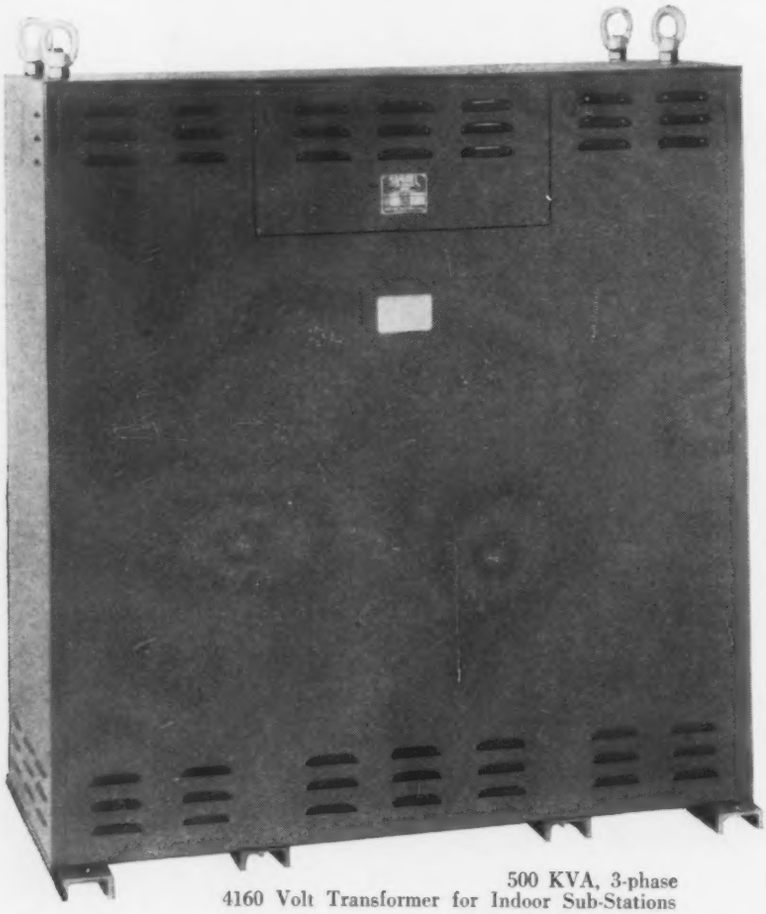
15 KVA, 3-Phase
Wall Mounting Type

for Every Purpose

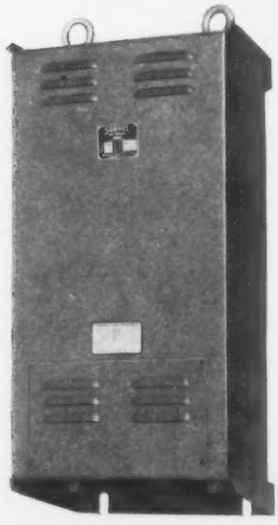
To operate 115 volt lighting and portable equipment from 230-460 or 575 volt power circuit. ¼ to 333 KVA. Single phase. 1 KVA to 1000 KVA. 3-phase.

To operate special equipment from standard circuits, to change odd voltages to standard voltages, and phase changing.

For interior high voltage distribution systems with transformers at load centers. Sizes up to 1000 KVA. Voltages up to 13,200.



500 KVA, 3-phase
4160 Volt Transformer for Indoor Sub-Stations



25 KVA, Single Phase
460/230 to 230/115 volt
Wall Mounting Type

50 KVA, Single Phase
Floor Mounting Type
With cover of connection compartment removed, showing solderless terminals

REPRESENTATIVES

FRED W. CARLSON
307 Wall, Seattle, Wash.
Portland, Oregon

CAMPBELL & GEORGE CO.
379 Brannan St., San Francisco

H. D. EASTERBROOK
1262 S. Boyle
Los Angeles 13, Calif.

SORGEL ELECTRIC CO., 844 W. National Ave., Milwaukee 4, Wis.

Pioneers in the development and manufacturing of Air-Cooled Transformers

COOPER

THE WEST'S LARGEST PLANT

Manufacturing threaded products for western industry

Top quality merchandise for 15 years has built Cooper into the largest mass-producer of standard or "special" screws, bolts, pins and rivets this side of Chicago. Hot or cold-forged fasteners from No. 6 to 1½" diameter; in lengths from 3/16" to 60"; in steel, brass, copper, bronze, monel, stainless or alloys; in bulk or package. *More than 50 million pieces are produced monthly.*

This modern plant is equipped to serve Western industry in many respects but especially in CAP SCREW. Range from ¼" to 1½" in diameter and up to 60" in length. Bright and high carbon.

Your Cooper jobber is ready to help you get quick delivery at low, competitive prices. Call him today. Let us mail you without obligation one of our handy screw gauges. It identifies screws or bolts in lengths up to 3" and diameters up to 7/16".

Representatives:
California Sales Agcy.
666 State Street
San Diego, Calif.

Robert L. Knowles Co.
613 2nd Nat'l Bk. Bldg.
Houston, Texas

Branch Office:
529 Central Bank Bldg., Oakland, Calif.

COOPER
Screw Manufacturing Company

4466 Worth Street **Los Angeles 33, California**

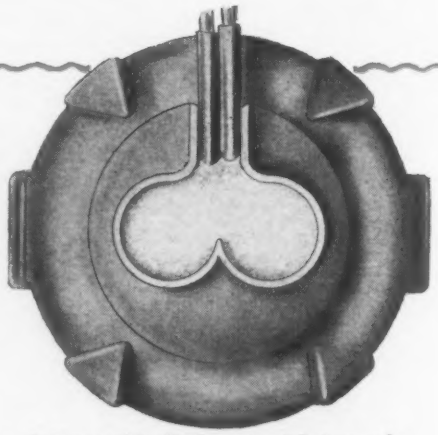
Fibron #5373
flexible plastic tubing

Here is another application where this improved Irvington formulation . . . Fibron #5373 . . . solves an electrical insulation problem involving high temperatures. Hot cement, used to seal the #5373-covered heating elements, has no effect on the flexibility of this unusual plastic. When the heater is in use, the tubing withstands continuous operating temperatures as high as 85° C. #5373 possesses the electrical, mechanical, and chemical properties which distinguish all Fibron tubings. Some of these are:

Dielectric Strength (.020″ wall) wet	1000 V.P.M.
dry	1000 V.P.M.
Tensile Strength, P. S. I.	3000
Life at 105° C.	2000 hours

Fibron #5373 tubing is available in all standard B & S wire gauge sizes, in six brilliant colors, in heavy wall thicknesses if required—in 36″ lengths, coils, or cut pieces.

Test this unusual product now. Generous samples and additional technical information gladly sent on request.



Approved by Underwriters' Laboratories for this application

Short lengths of Fibron #5373 are used to protect the conductor leads on the heating element of the Electra-Serve, manufactured by Electrical Industries, Inc., Newark, N. J. This bottom view of the unit shows where the hot cement seals over the #5373 insulation. Withstanding this heat and high operating temperatures, #5373 tubing retains its flexibility and high dielectric strength.

IRVINGTON *Varnish and Insulator Company* IRVINGTON 11, NEW JERSEY, U.S.A.

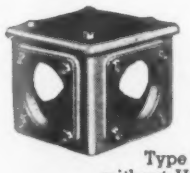
Authorized distributors in: BALTIMORE · BLUEFIELD, W. VA. · BOSTON · CHARLOTTE · CHICAGO · CLEVELAND · DALLAS · DENVER · LOS ANGELES · MINNEAPOLIS
NEW HARTFORD, N. Y. · NEW YORK · NEW ORLEANS · PHILADELPHIA · PITTSBURGH · ST. LOUIS · SAN FRANCISCO · SEATTLE · HAMILTON, ONT., CANADA

CROUSE-HINDS

Detachable Hub Plates for CONDULETS

Many CONDULETS are designed to take demountable hub plates, thus extending their usefulness. When such CONDULETS are installed, it is easy to tap an electrical conduit system at any time and add branch circuits without interrupting service. Simply remove a blank plate and add a plate with the required number and size of hubs. In many cases demountable hub plates make the use of unions unnecessary. Crouse-Hinds hub plates can also be used as pipe flanges that have the advantage of an internal bushing. (See outline drawing below.)

The illustrations show a selection of detachable hub plates and a few of the CONDULETS that take such plates.

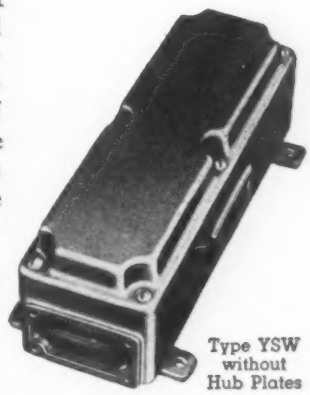


Type RSS without Hub Plates

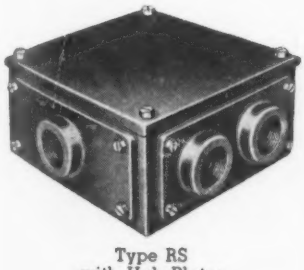
Type RSM without Hub Plates

No. 13

of a series of advertisements which demonstrate that CROUSE-HINDS "complete line" means much more than just a range of sizes — there is a wide variety of highly specialized types in each classification.

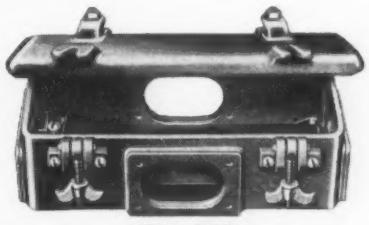


Type YSW without Hub Plates

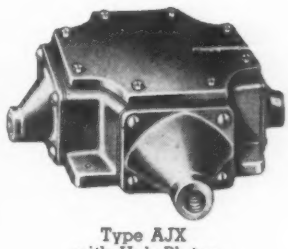


Type RS with Hub Plates

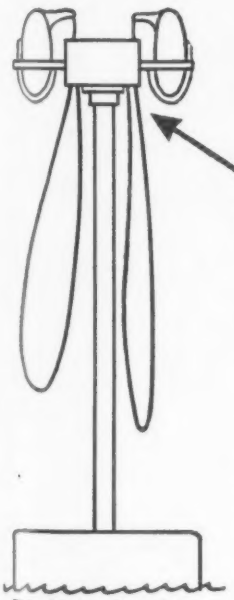
Type YYC with Hub Plates



Type YWX without Hub Plates



Type AJX with Hub Plates



This drawing shows the use of Crouse-Hinds hub plate RSMP 6 as a pipe flange for attaching speakers to electrical conduit at drive-in theaters. There are many similar problems in all industries.

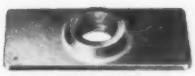
Type RSMP Two Hubs

Type RSMP One Hub

Type LOB Hub Plate Straight

Type LOB Hub Plate Angle

Type GS Hub Cover



Type RSP One Hub

Type RSP Two Hubs

Type RSP Three Hubs

Type LOB Hub Cover

Type GSG Hub Plate

Type YYAP One Hub 90° Back and Front

Type YYLP One Hub 90° Left and Right

Type YYSP Two Hubs 90° Left and Right

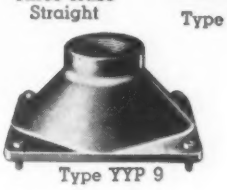
Type CUH Hub Plate for Joining Conduit to a Pole

Type YYP Blank Plate

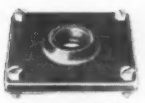
Type YYP One Hub Straight

Type YYP Two Hubs Straight

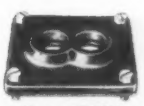
Type YYP Three Hubs Straight



Type YYP 9



Type UGEB One Hub

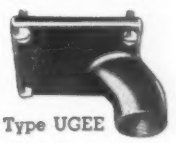


Type UGEB Two Hubs

Type UGEF

Type PED Pedestal Not Threaded

Type PED Pedestal Threaded Broken Away View



Type UGEE

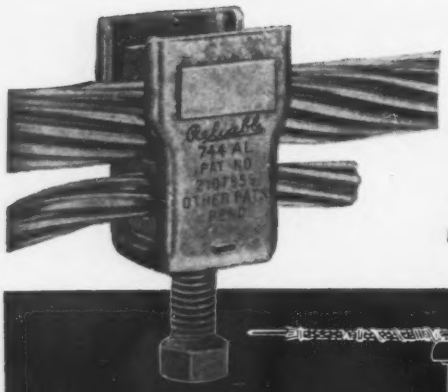
A Nationwide Distribution Through Electrical Wholesalers

CROUSE-HINDS COMPANY

Syracuse 1, N. Y., U.S.A.

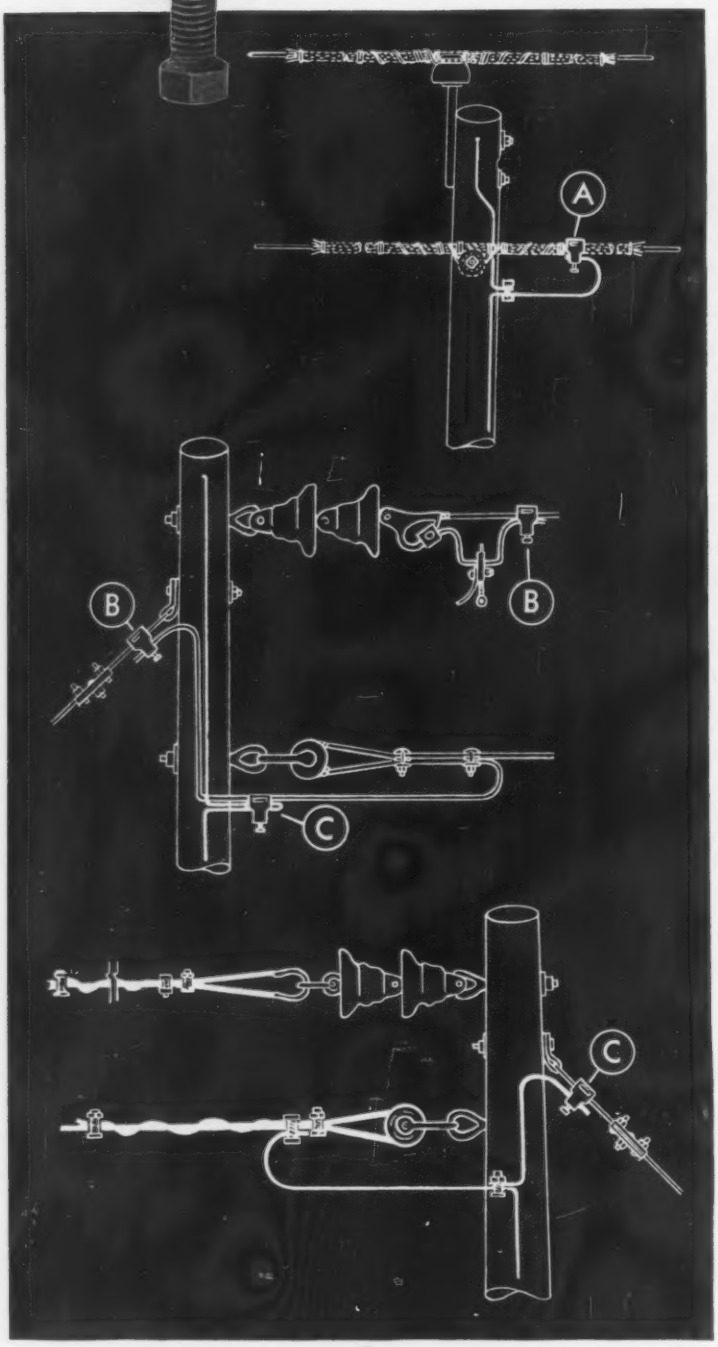
Offices: Birmingham — Boston — Buffalo — Chicago — Cincinnati — Cleveland — Dallas — Denver — Detroit — Houston — Kansas City — Los Angeles — Milwaukee — Minneapolis — New York Philadelphia — Pittsburgh — San Francisco — Seattle — St. Louis — Washington. *Resident Sales Engineers:* Albany — Atlanta — Charlotte — Indianapolis — New Orleans
CROUSE-HINDS COMPANY OF CANADA, LTD., *Main Office and Plant:* TORONTO, ONT.

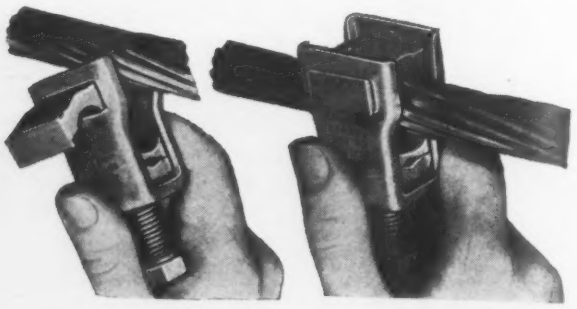
CONDULETS · TRAFFIC SIGNALS · AIRPORT LIGHTING · FLOODLIGHTS



Reliable FLIP-ON TAP CLAMPS

. . . MAKE QUICK AND TROUBLE-FREE CONNECTIONS TO ACSR OVER ARMOR RODS AND TO GUY WIRES





A. For grounding ACSR neutrals or making other copper taps to #4-ACSR over armor rods (.555" dia.), use Reliable #555-ALC Flip-on Tap Clamps. For #1/0 ACSR over armor rods (.7444" dia.), #744-ALC.

B. For grounding ACSR or steel neutrals to guy wire 7/16" (.438" dia.) or smaller, use Reliable # 438 - AL Flip-on Tap Clamps.

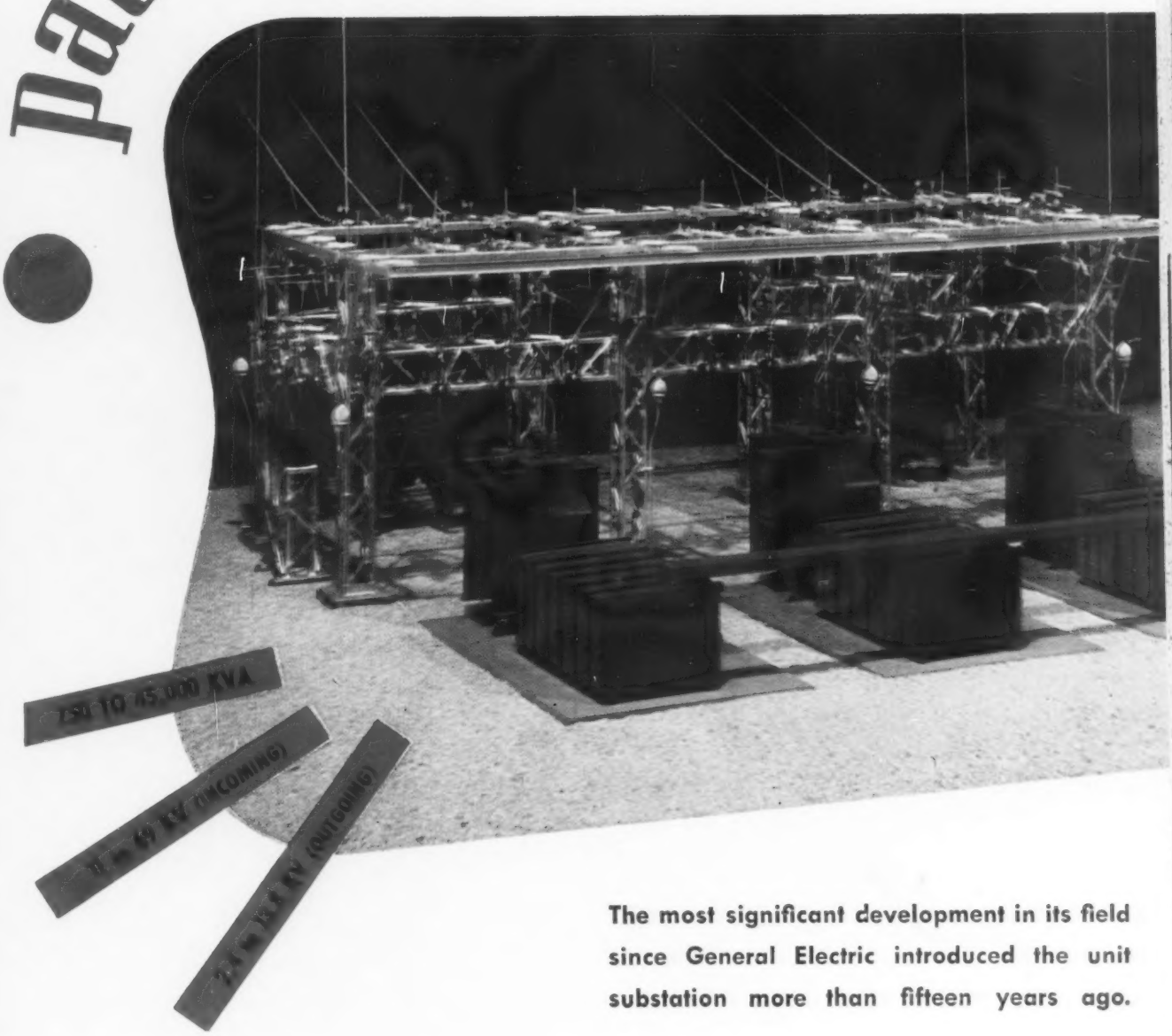
C. For grounding copper neutrals to guy wire 7/16" or smaller, use Reliable #438-ALC Flip-on Tap Clamps.

New high strength alloy makes these champs 50% stronger than pre-war.

Reliable ELECTRIC COMPANY
3145 CARROLL AVENUE CHICAGO 12
35 Years Service to the Utilities

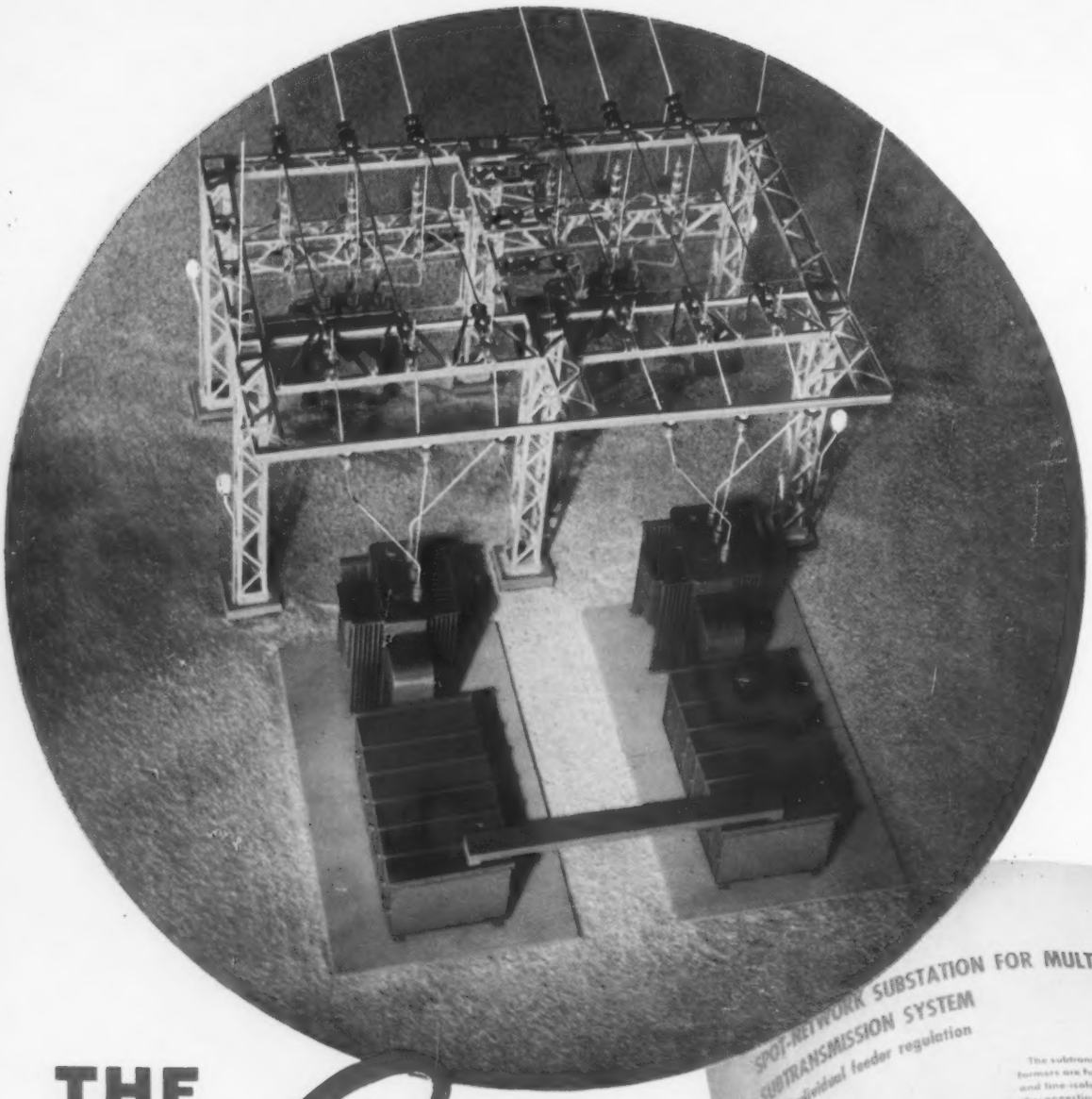
announcing

package substations



The most significant development in its field since General Electric introduced the unit substation more than fifteen years ago.

GENERAL ELECTRIC



THE *New* package

COMPLETE STEEL STRUCTURE

Fabricated Steel Columns and Other Steel Members **Erection Drawings**
Arrangement Drawings **Mounting Bolts** **Foundation Bolts**

(All in accordance with NEMA Specifications for outdoor steel structures as given in Power Switching Equipment Standards No. 45-94)

METERING AND RELAYING **OUTDOOR OIL CIRCUIT**
POTENTIAL TRANSFORMERS **BREAKERS (OR FUSES)**
LIGHTNING ARRESTERS **STATION LIGHTING**

MASTER UNIT SUBSTATIONS

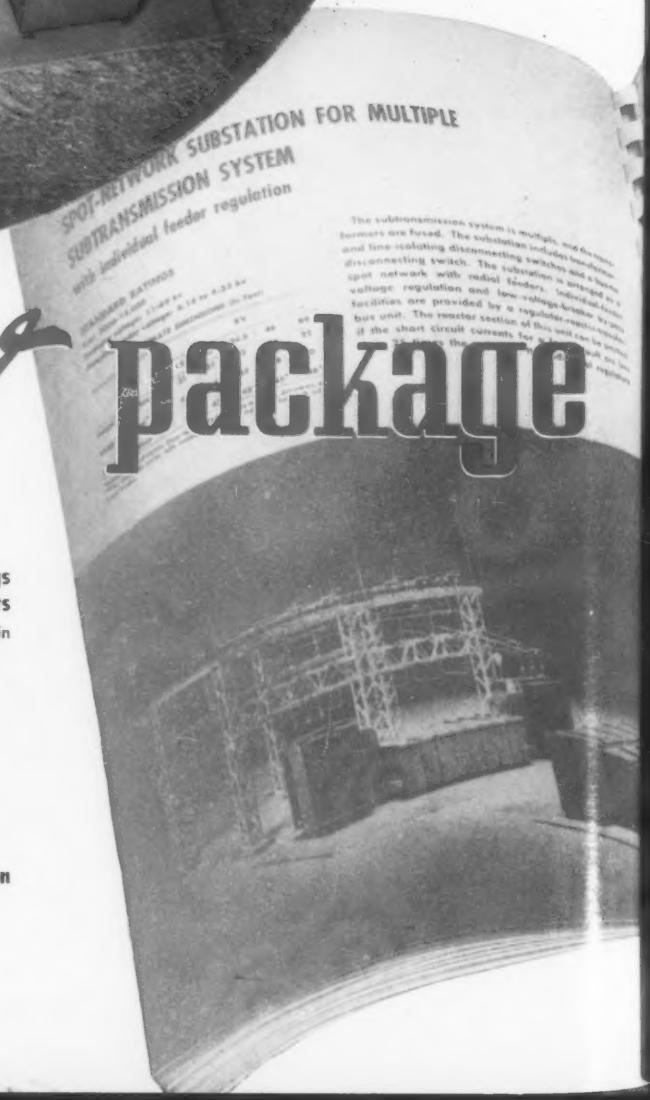
RELAYING

Carrier Current **Pilot Wire** **Reverse-power** **Phase-comparison**
Distance **Differential** **Overload** **Reclosing**

CONTROL CABLE

COMPLETE WIRING DIAGRAM

IT'S ALL CO-ORDINATED



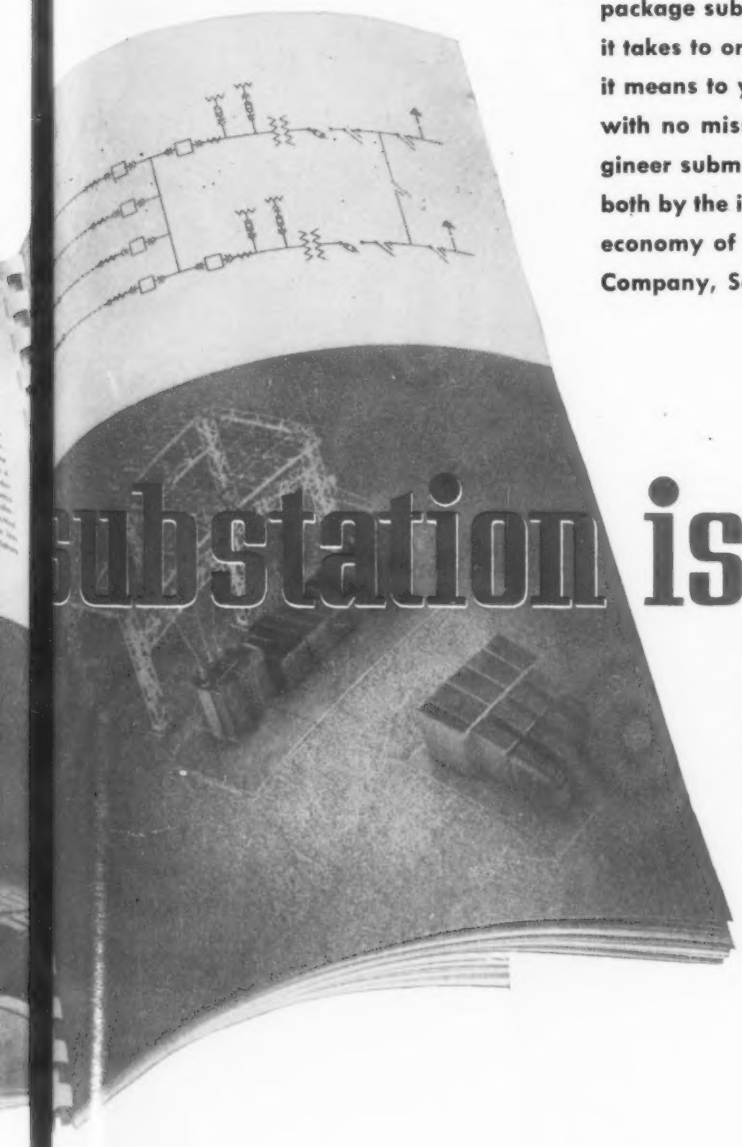
THE package substation is new and distinct. It combines in a single unit the necessary *unit substations,* together with *complete steelwork and all other required electric equipment* for substations rated 750 to 45,000 kva, with incoming voltages up to 69 kv.

Everything you need between the incoming high-voltage lines and the outgoing feeders is ordered, built and shipped to you as a *unit.*

The natural advantages of ordering functionally-related equipment as a unit are already enjoyed by thousands of *unit substation* users. These benefits are now multiplied in the *package substation,* which extends the same easy selection, over-all co-ordination and quick, economical installation to the many applications that require—in addition to one or more unit substations—steelwork and a combination of the electric equipment listed on the opposite page.

For your next specific application, estimate the savings—in dollars, time and headaches—you can make in ordering a complete package substation promptly, without the months of costly detail work it takes to order and co-ordinate the components piecemeal. Add what it means to you to get a fully-co-ordinated, ready-to-install substation, with no missing or "forgotten" items. Then have your G-E sales engineer submit a proposition. We believe you'll be pleasantly surprised both by the initial savings and, later, by the on-the-job advantages and economy of the package substation. Apparatus Dept., General Electric Company, Schenectady 5, N. Y.

You have hundreds of package substations from which to select the one that matches your needs. This new 78-page bulletin illustrates the thirty standard types into which they fall, gives you helpful application information on each and shows you just how each will look installed. Get a copy of GEA-4500 from your G-E sales representative, or write to Apparatus Department, General Electric Co., Schenectady, N.Y.



substation is *COMPLETE*

IN RATINGS WHERE COMPLETENESS IS WORTH THE MOST

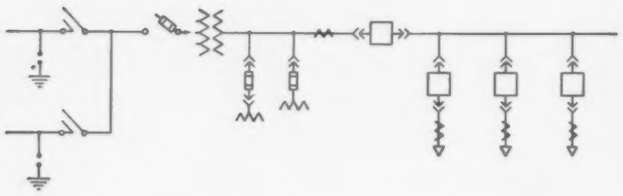
750 to 45,000 kva
11 to 69 kv (Incoming)
2.4 to 13.8 kv (Outgoing)

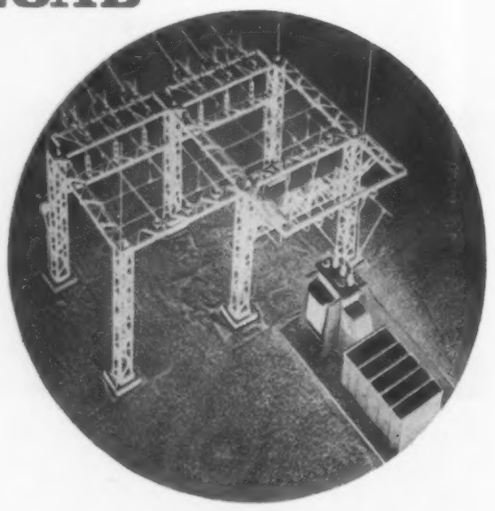
GENERAL ELECTRIC

321-51-5900

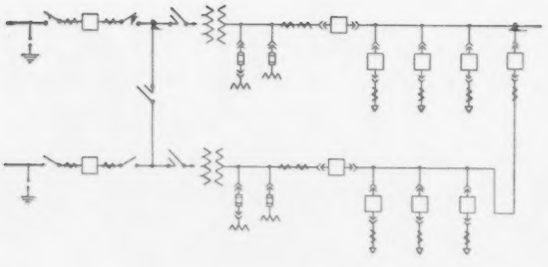
the G-E package substation . . .
CAN GROW WITH YOUR LOAD

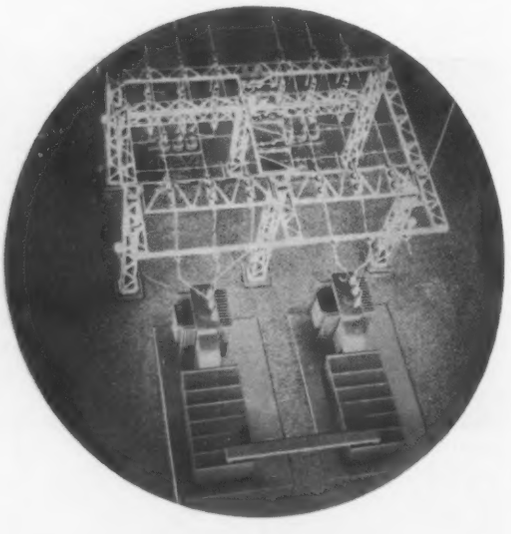
1947



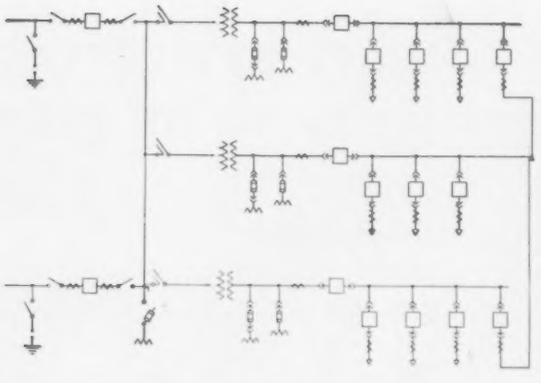


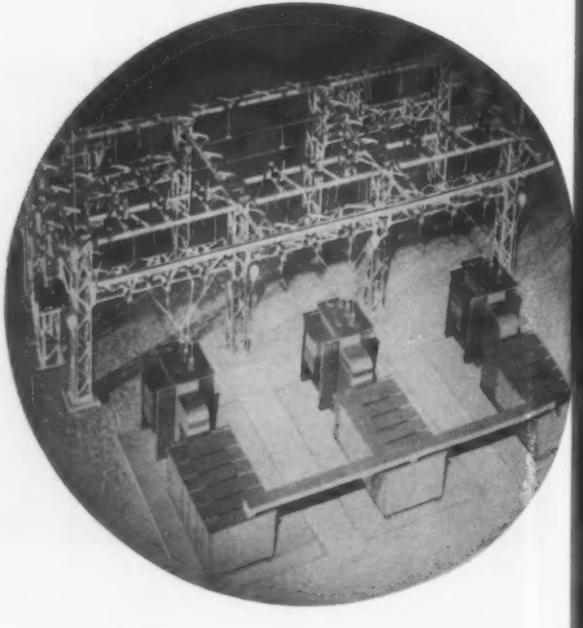
1950





1952

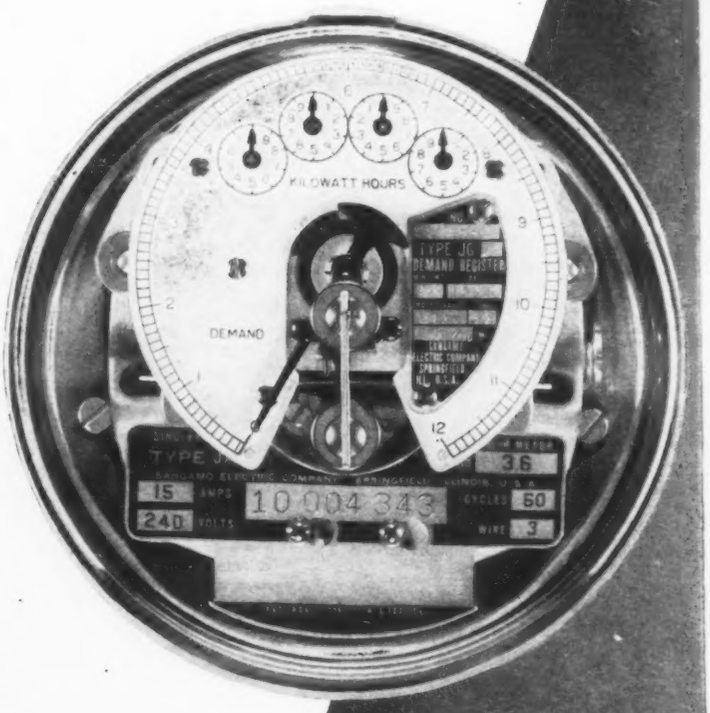




GENERAL ELECTRIC

measured DEMAND

the direct basis of billing for fixed charges . .



Type JS with JG Demand Register

Longer hours of use and improved operating efficiencies have resulted in the present low price of the kilowatthour. However, unless load factors are further improved, today's high costs will not permit satisfactory operations at present low rates.

MEASURED DEMAND helps to solve this problem by encouraging your customers to improve their load factor. MEASURED DEMAND also provides the most direct basis of billing for fixed charges. An extensive line of Sangamo Demand Instruments is available to meet your specific need FOR ALL CLASSES OF SERVICE.

★ Sangamo Type JS meter with JG Demand Register for measurement of singlephase kilowatthours and kilowatt demand where a simple, compact, and economical unit is required. The Type JG Demand Register can also be supplied separately for existing meters.

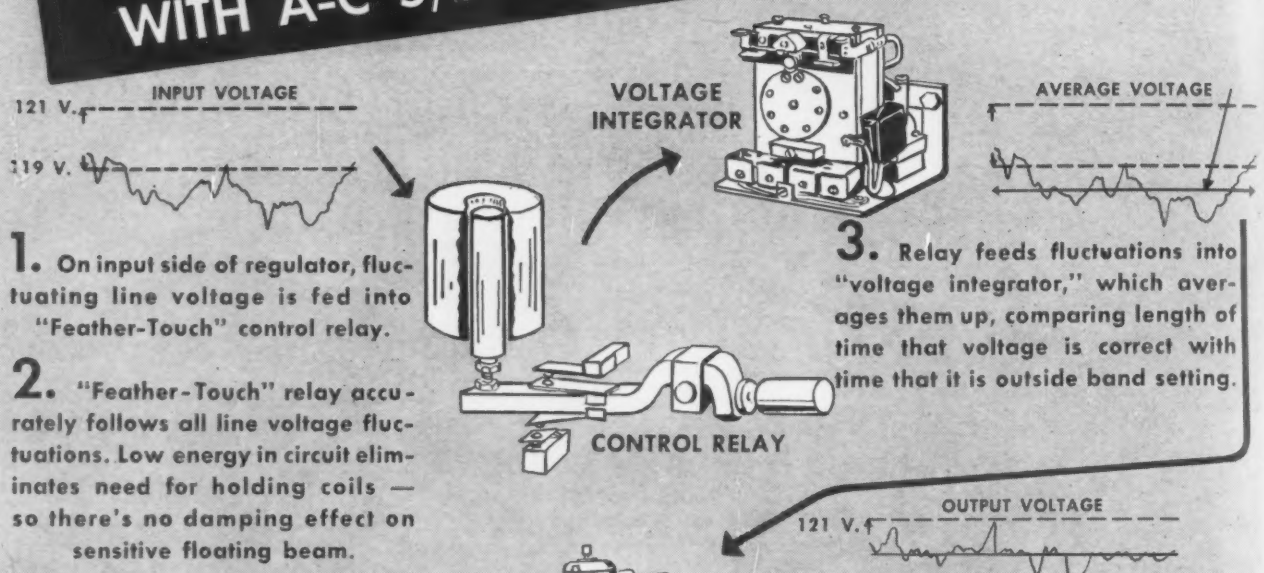
Type JWS

Type LC-2-P With LG Demand Register

Type JWS combination watthour and Lincoln watt demand meter for measurement of demand on singlephase circuits on the thermal principle. Type LC-2-P meter with LC Demand Register for measurement of demand on polyphase circuits.

SANGAMO ELECTRIC COMPANY
SPRINGFIELD • ILLINOIS

Get Closest Line Voltage
WITH A-C 5/8% STEP REGULATORS



1. On input side of regulator, fluctuating line voltage is fed into "Feather-Touch" control relay.

2. "Feather-Touch" relay accurately follows all line voltage fluctuations. Low energy in circuit eliminates need for holding coils — so there's no damping effect on sensitive floating beam.

3. Relay feeds fluctuations into "voltage integrator," which averages them up, comparing length of time that voltage is correct with time that it is outside band setting.

4. If average voltage is either too high or too low, voltage integrator operates tap-changing motor, returning voltage to normal.

HOW ALLIS-CHALMERS VOLTAGE CONTROL OPERATES

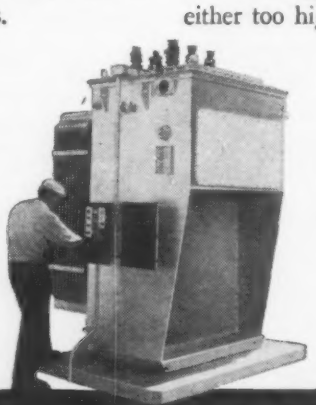
YOU CAN HAVE the best in feeder voltage regulation, on the average feeder line, with Allis-Chalmers' 5/8% Step Regulators.

Voltage is easily held within a total band width of plus-minus 5/8%, or 3/4 volt, by "Feather-Touch" control relay. Since holding coils are unnecessary, there's no damping effect to prevent relay from following closely each voltage fluctuation which occurs on the line.

These fluctuations are fed into the voltage integrator, which averages them up. If *average* voltage on line is either too high or too low, the integrating device allows regulator to make necessary correction — thus maintaining voltage at desired level.

A-C 5/8% Step Regulators regulate all feeder voltages. See our nearby sales office for more facts, or write to ALLIS-CHALMERS, MILWAUKEE, WIS.

A 2058



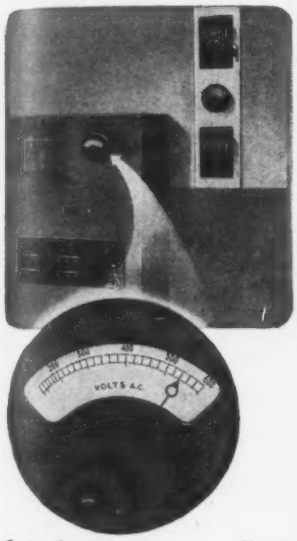
ALLIS-CHALMERS

★ One of the Big 3 in Electric Power Equipment
Biggest of All in Range of Industrial Products ★

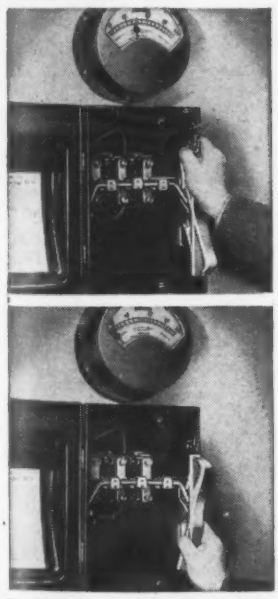
5/8% STEP REGULATORS

Avoid dangerous arcs. Use *Vacu-Break* safety switches

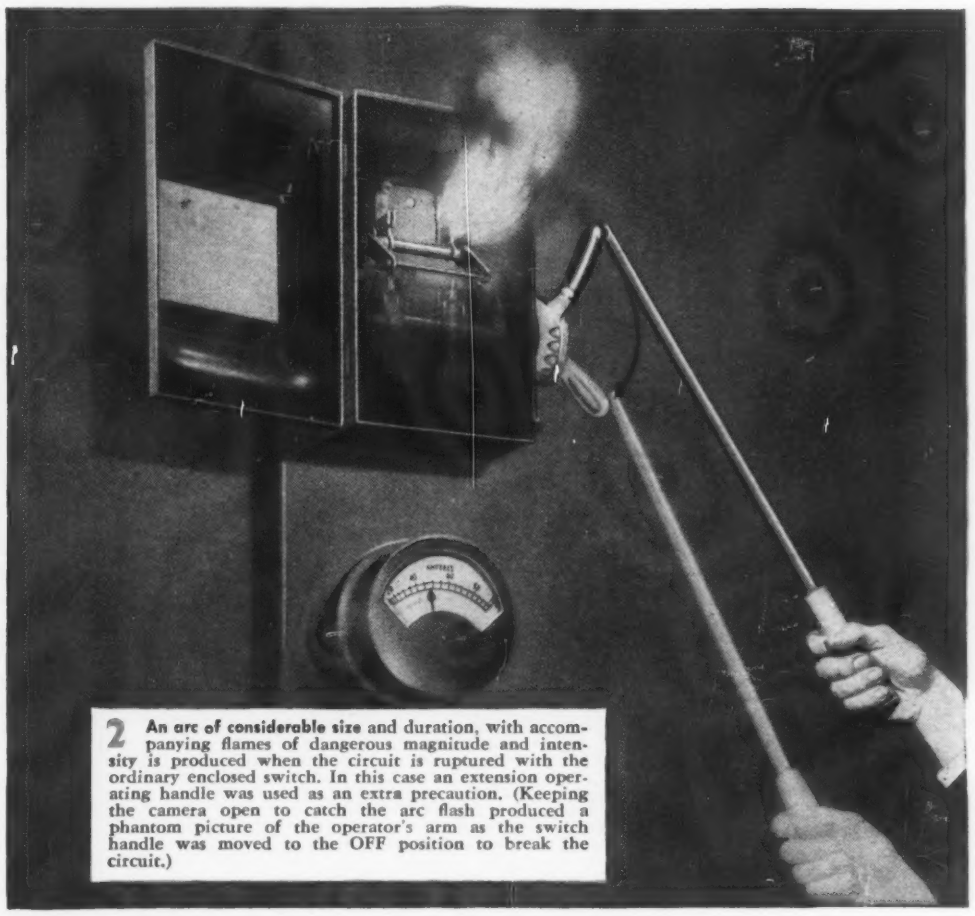
Laboratory Tests Prove The "Hidden Values" of Safety and Efficiency of *Vacu-Break* Safety Switches, Compared With Ordinary Enclosed Switches.



1 In the test set-up, an ordinary enclosed switch and a Vacu-Break Safety Switch are connected in parallel so that either switch can be used to make or break a 30% power factor load of 50 AMPERES, 540 Volts. This power factor approximates the condition prevailing in the case of a motor with a stalled rotor.



3 The arc is barely visible when the circuit is ruptured with the VACU-BREAK Safety Switch under the same conditions (but without the precaution of the extension operating handle). Two photos, showing the VACU-BREAK Switch at the instant of opening and closing, differ only in the position of the handle and the operator's hand and the position of the ammeter needle.



2 An arc of considerable size and duration, with accompanying flames of dangerous magnitude and intensity is produced when the circuit is ruptured with the ordinary enclosed switch. In this case an extension operating handle was used as an extra precaution. (Keeping the camera open to catch the arc flash produced a phantom picture of the operator's arm as the switch handle was moved to the OFF position to break the circuit.)

DON'T take risks in your plant! Get the positive protection of BullDog VACU-BREAK Safety Switches. Their quick-acting Clampmatic Contacts, "tight as a bolted connection," and the exclusive Bakelite Arcing Chamber that snuffs out dangerous arcs safely and instantaneously, insure long, trouble-free switch life.

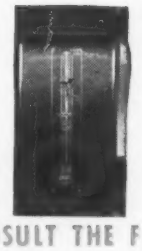
For these authentic test pictures show that even with as small a load as 50 AMPERES, dangerous power arcs can develop on motor circuits under stalled rotor conditions or on welding circuits or similar types of inductive loads.

In such cases, with ordinary enclosed switches a large open arc can jump to a pole of opposite polarity or to the steel switch enclosure causing a dangerous short circuit power arc.

So avoid all such hazards to your personnel and property and minimize pitting and arcing of contacts which lead to eventual break-downs by always specifying —VACU-BREAK—when ordering safety switches.

• • •

BullDog Also Manufactures BUStribution DUCT — Switchboards — Panelboards — Circuit Master Breakers — Industrial Trol-E-Duct for Portable Tools, Cranes, Hoists—Universal Trol-E-Duct for totally flexible lighting.



BULLDOG

ELECTRIC PRODUCTS COMPANY
DETROIT 32, MICHIGAN

In Canada: BullDog Electric Products of Canada, Ltd., Toronto
Field Offices in All Principal Cities

CONSULT THE FOLLOWING PACIFIC COAST REPRESENTATIVES:

Coast Electric & Manufacturing Co.
1720 N. E. Sixth Avenue Tel. Garfield 2844
Portland, Oregon

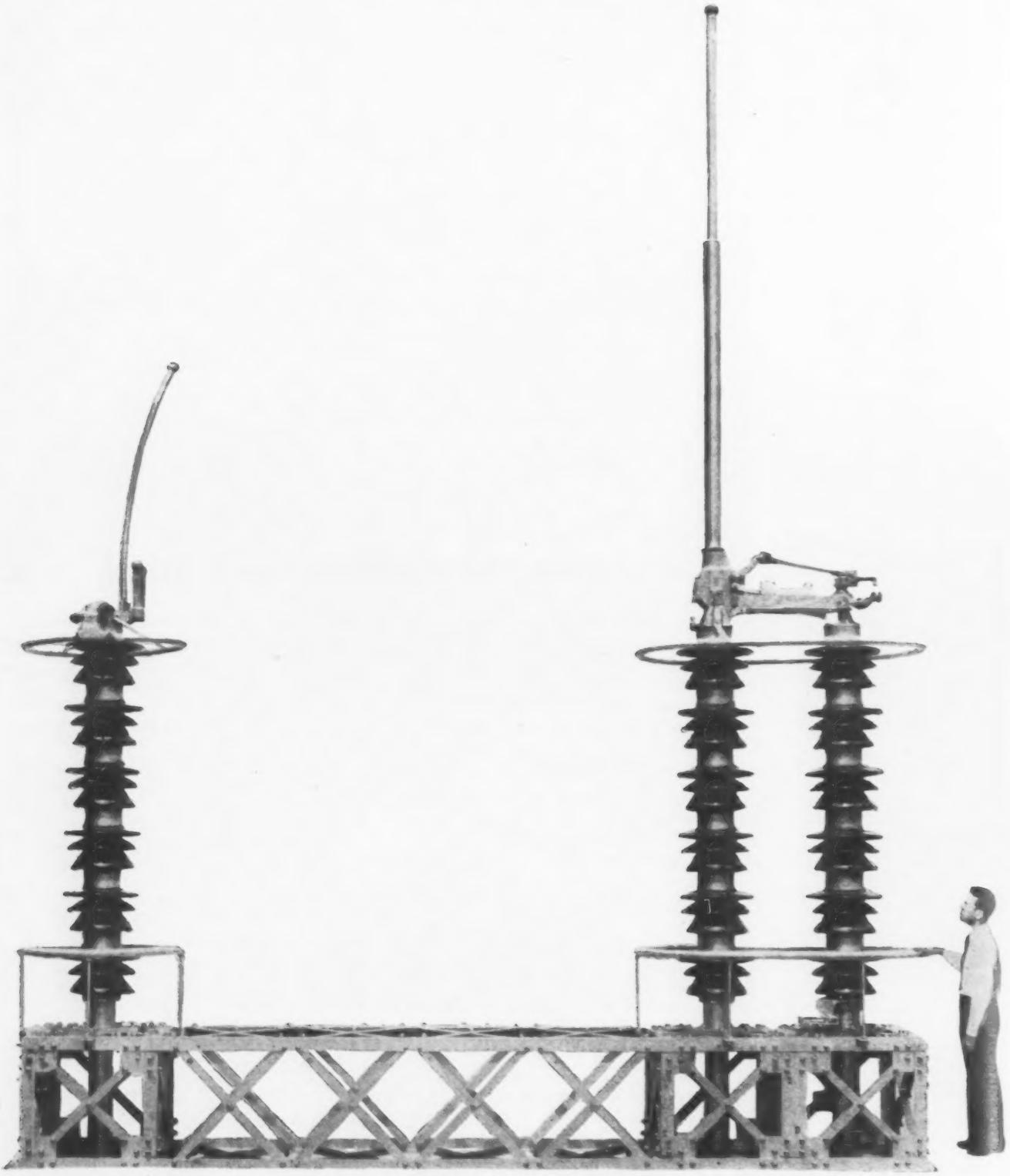
Safety Switchboard Company
1445 Stevenson St. Tel. Hemlock 2470
San Francisco, Calif.

Mullenbach Electrical Manufacturing Co.
2300 East 27th Street Tel. Jefferson 2224
Los Angeles, Calif.

Cole Electric Co.

1510 So. Los Angeles St. Los Angeles (15), Calif.

PRospect 2068



AIRBREAK DISCONNECTING SWITCH
230,000 Volts—1200 Amperes, Type OU, T.P.S.T. Vertical Break, Group Operated. (One Pole Shown)

ON OR OFF THE HIGHWAY
FWDs DO MORE WORK
All-Year 'Round!

For earth-boring, pole setting, line construction and maintenance, heavy lugging, or emergency service . . . on or off the highway . . . the FWD is known as "The ONE Truck for MANY Jobs". Over rough terrain, in rocky, mountainous areas, in deep mud, sand, or winter's worst snow, FWDs go through with men and equipment, faster, safer, to get more work done.

FWDs are rugged. They have ample power . . . unequaled traction. Bodies engineered specifically for utility requirements help get more work done. These are reasons why more than 150 utilities operate FWDs . . . some companies have fleets of 200 or more!

See the nearest FWD Distributor, or write for data.

THE FOUR WHEEL DRIVE AUTO COMPANY
Clintonville, Wisconsin
Canadian Factory: KITCHENER, ONTARIO

FWDs do all snow-fighting and ice-cutting on trolley and bus routes of Omaha & Council Bluffs Ry. Co., operating a large fleet of FWDs for many jobs.

★ ★ ★

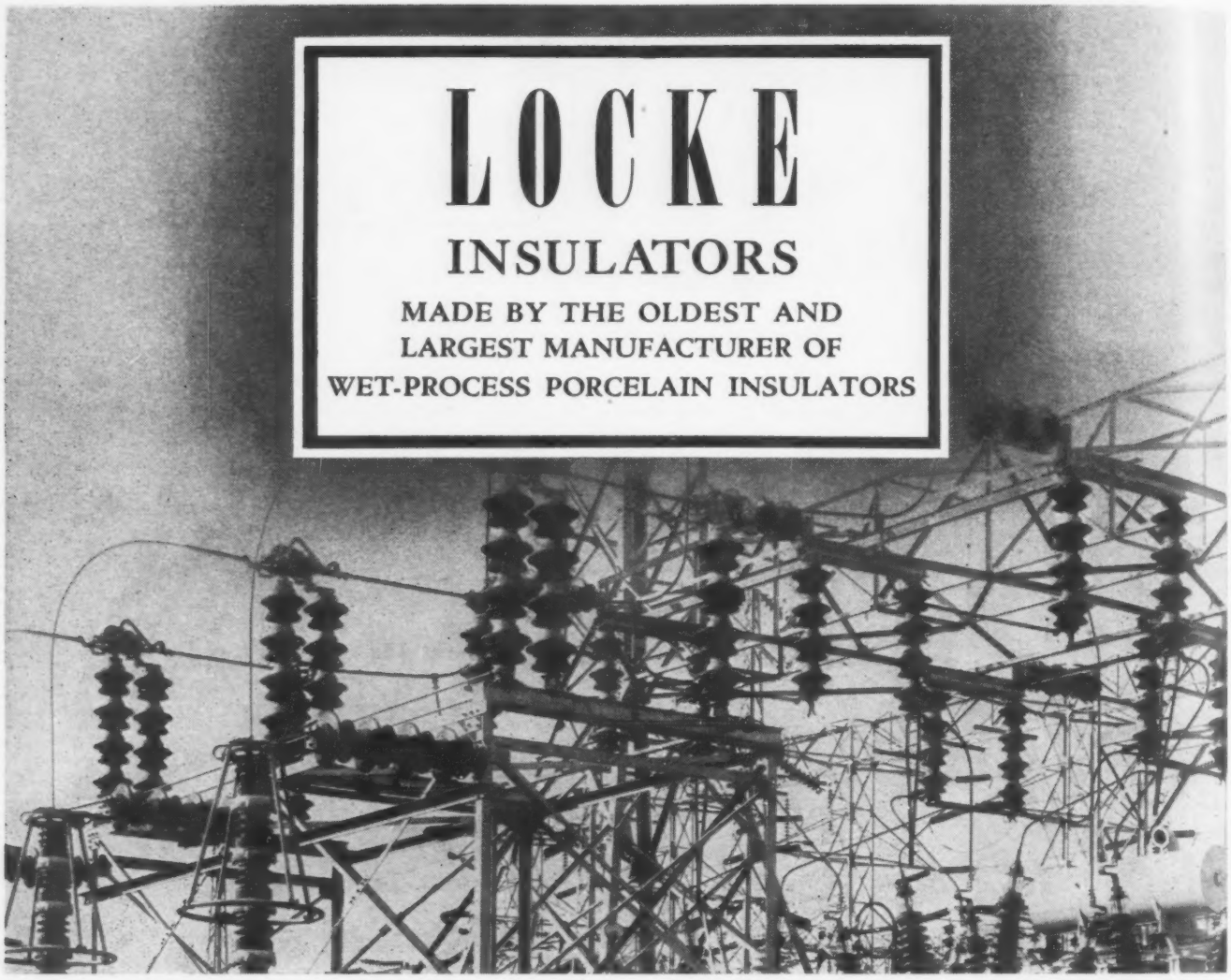
Over the rugged Gogebic iron range in Michigan's northern peninsula, FWDs get through to any required position, fast and safely, with men and equipment.

★ ★ ★

FWD TRUCKS

National Distributors — Graybar Electric Company

REGIONAL SALES AND SERVICE: Arizona-Cedar Rapids Co., 401 N. First St., Phoenix; CALIFORNIA—The Four Wheel Drive Auto Co., 1339 Santa Fe Ave., Los Angeles 21 and FWD Pacific Co., 469 Bryant St., San Francisco 7; COLORADO—Liberty Truck & Parts Co., P. O. Box 1889, Denver 1; IDAHO—Intermountain Equipment Company, Broadway at Myrtle St., Boise; MONTANA—Steffeck Equipment Co., 11 E. Cutler St., Helena; NEVADA—Allied Equipment Co., Reno; NEW MEXICO—The Myers Company, Las Cruces; OKLAHOMA—Halliburton Oil Well Cementing Co., P. O. Drawer 471, Duncan; OREGON—Feenaughty Machinery Co., 112 S.E. Belmont St., Portland 14; UTAH—Cate Equipment Co., 49 E. 9th So., Salt Lake City; WASHINGTON—Feenaughty Machinery Co., 1028 4th Ave., So., Seattle 2, Glenn Carrington & Co., 91 Columbia St., Seattle and Feenaughty Machinery Co., 715 N. Division St., Spokane; WYOMING—Wortham Machinery Co., 517 W. 17th St., Cheyenne; ALASKA—Glenn Carrington & Co., Nome, Fairbanks, Anchorage, and The Graybar Electric Co., in over 90 principal cities.



LOCKE

INSULATORS

MADE BY THE OLDEST AND LARGEST MANUFACTURER OF WET-PROCESS PORCELAIN INSULATORS

All eleven Offices and Warehouses of the **GENERAL ELECTRIC SUPPLY CORPORATION,** on the Pacific Coast, can give you information on **LOCKE** Insulators.

The following recent developments in LOCKE Insulators add stability—

1. Locke Compression Glaze
2. Locke Compression Sand
3. Permazinc Double Plated Hot Dipped Galvanizing
4. Locke Reinforced Edges

DISTRIBUTORS ON THE PACIFIC COAST

GENERAL ELECTRIC

SUPPLY CORPORATION

SAN FRANCISCO • OAKLAND • SACRAMENTO • FRESNO • LOS ANGELES
SAN DIEGO • PHOENIX • SEATTLE • PORTLAND • TACOMA • SPOKANE

STEP-BY-STEP PROTECTION

. . . insures year-after-year values in Okonite-Callender power cables

Now more than ever, it pays to get top quality in paper-insulated power cables. Today's high installation costs demand it. Tomorrow's high repair and maintenance costs demand it.

So, when you buy on a value-first and final-economy basis, remember what Okonite-Callender paper insulated power cables offer you. Here is evidence of their step-by-step protection.

1. **Copper conductors** electrolytically cleaned. No foreign matter to impair insulation's dielectric qualities. Sector conductors are so shaped that no plane surfaces and sharp angles prevent snug fit of insulating tapes on conductor.

2. **Metallized paper tape,** between conductor and insulation, keeps out objectionable products of reactions between copper and oil. Provides smooth conducting surface under insulation. Also wrapped over insulation, metallized tape maintains electrical contact with metal shielding tape or lead sheath, preventing ionization when sheath expands.

3. **Oil-impregnated insulation** possesses high stability. Power factor measurements made at intervals on sealed lengths of this cable kept in oven maintained at 100°C show that even after four years of severe exposure there is no appreciable deterioration of the insulation.

4. **Stabilized Lead Sheath** — Okonite-Callender's sodium treatment removes impurities in the original lead, prevents others from developing during sheath-forming. Welds are strong. Sheath thickness uniformity controlled through use of electronic concentricity gauge.

5. **Okosheath Protective Covering** — a durable corrosion-resistant covering that may be added where lead requires protection from chemical attack. Also insulates lead sheath against electrolytic corrosion.

Okonite-Callender maintains a continuing research program to find the best materials and learn how best to use them. Okonite-Callender engineers are always ready to discuss with you specific advantages of various cables of the solid, oil-filled and gas pressure types and of the Oilostatic Transmission System . . . to help you decide which offers the best year-after-year value in paper insulated power cables. The Okonite-Callender Cable Company, Inc., Executive Offices, Passaic, N. J.

OKONITE - CALLENDER

paper-insulated power cables

1644

WANTED for homes

Shown in this advertisement are four fixtures of almost universal usefulness—from the latest Virden productions.

We like to believe that applications for these good fixtures are so clear and practical that every lighting man will see instantly how Virden Values open the door to opportunity everywhere.

Available now. See your Virden jobber.

Lantern No. 277

No. 612
Pressed Glass
for General Use

Bent Glass
for Bedrooms
No. 415

VIRDEN VALUE

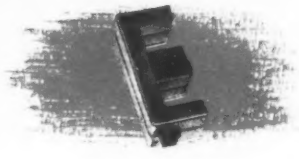
Drum Type
Kitchen
Unit

THREE SIZES
V-506, 1 light
V-508, 2 lights
V-510, 3 lights

John C. Virden Company • Cleveland, Ohio

Member American Home Lighting Institute

There's nothing puzzling about the huge, ever growing number of important installations that include FEDERAL NOARK controls. They're "part of the picture" of modern industry, fitting closely into plans that call for absolute dependability at every point. Write for your copy of the Federalog, containing complete specifications on FEDERAL NOARK Electric Products . . . Federal Electric Products Company, Executive Offices: 50 Paris Street, Newark, N. J. Plants: Hartford, Conn., Newark, N. J., St. Louis, Mo., Long Island City, N. Y.



E . . . AS IN "EFFICIENT"!

The magnets used in FEDERAL NOARK Controls are E-shaped and proportioned to give a strong pull with very low power consumption another feature that typifies the inbuilt quality of all FEDERAL NOARK Electric Products.

Federal NOARK

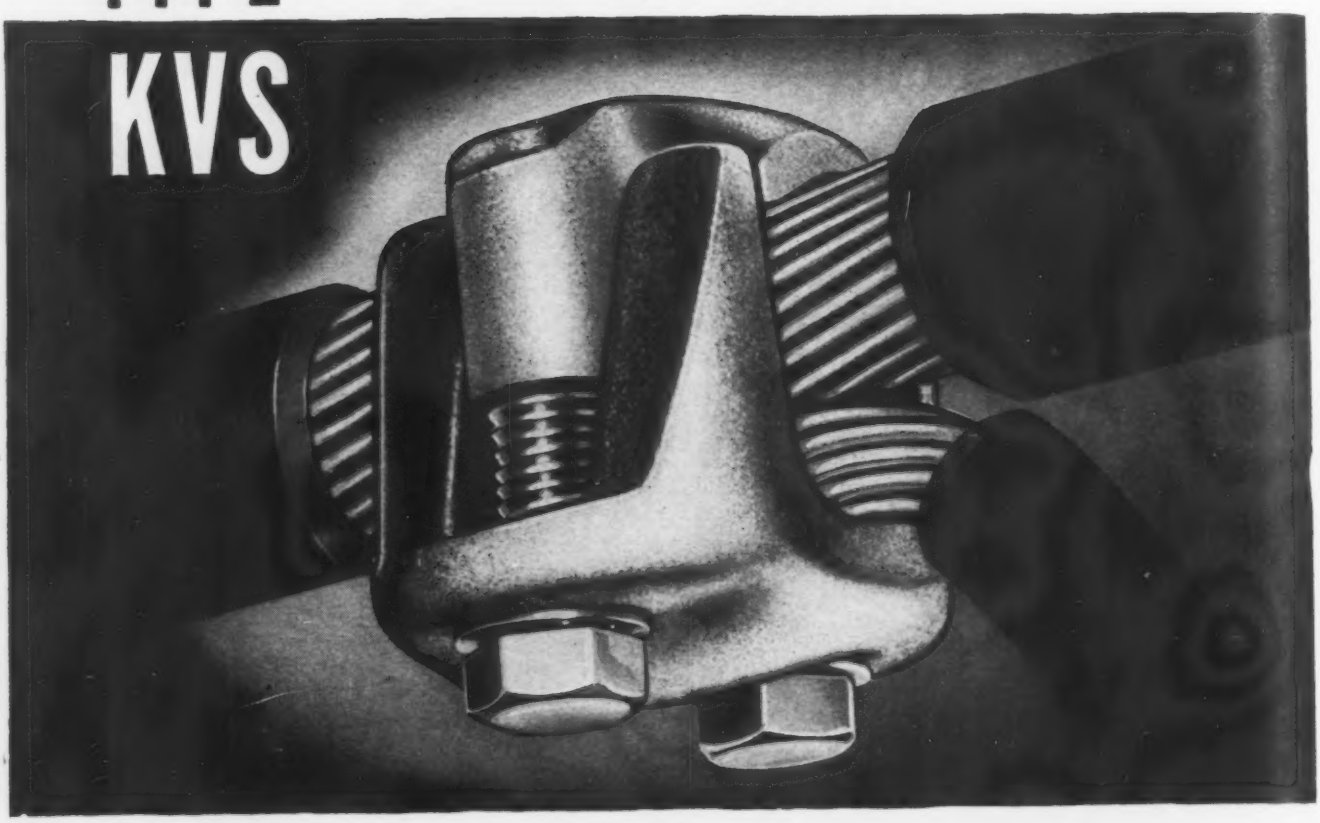
INDUSTRIAL CONTROLS

FEDERAL ELECTRIC PRODUCTS COMPANY, MANUFACTURERS OF A COMPLETE LINE OF ELECTRICAL PRODUCTS INCLUDING MOTOR CONTROLS, SAFETY SWITCHES, CIRCUIT BREAKERS, SERVICE EQUIPMENT, PANELBOARDS AND SWITCHBOARDS

BURNDY

OKLIP

TYPE KVS

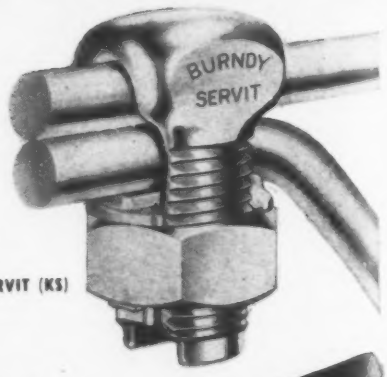


Especially designed for large conductors by completely encircling and firmly forcing them into high pressure contact. Five sizes take all conductors from 4/0 to 1000 Mcm. Rapidly installed with an ordinary wrench. Compact design and rounded edges permit easy taping. KVS is made of high-strength bronze alloy. Write your local Burndy representative or direct to factory.

BURNDY • NEW YORK 54 • N. Y.

In Canada: Canadian Line Materials, Ltd., Toronto 13
Foreign: Philips Export Corporation, New York 17

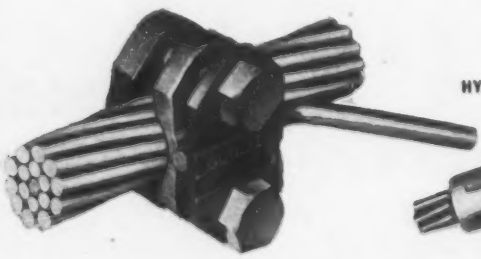
OTHER BURNDY FAVORITES:



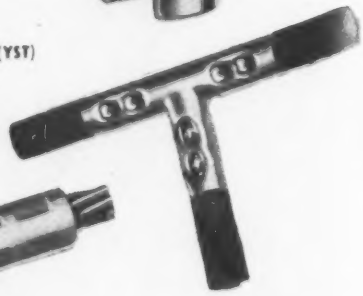
SERVIT (KS)

BUTTIN (KP)

ARMOR ROD CLAMP (BPG)



HYTAP (YST)



HYSPLICE (YCS)

I always use "Central Conduit"

I figure a company which has such a good and long-standing reputation surely knows its business.

"There's Tested Strength in Every Length"

CENTRAL
RIGID STEEL
CONDUIT

SPANG-CHALFANT

Division of The National Supply Company

General Sales Office: Grant Building, Pittsburgh 30, Pa.

District Offices and Sales Representatives in Principal Cities

here you have Customer Good-Will

From the complete line of OLIVER POLE LINE MATERIALS

plus maintenance economy!

OLIVER

STATIC-PROOF HARDWARE

Practical help in solving two important public utility problems is provided by Oliver Static-Proof Hardware.

Extensive investigations show that looseness between component parts of pole line hardware causes radio interference. This sometimes becomes a serious public-relations problem. Oliver Static-Proof Hardware has been designed to eliminate this trouble.

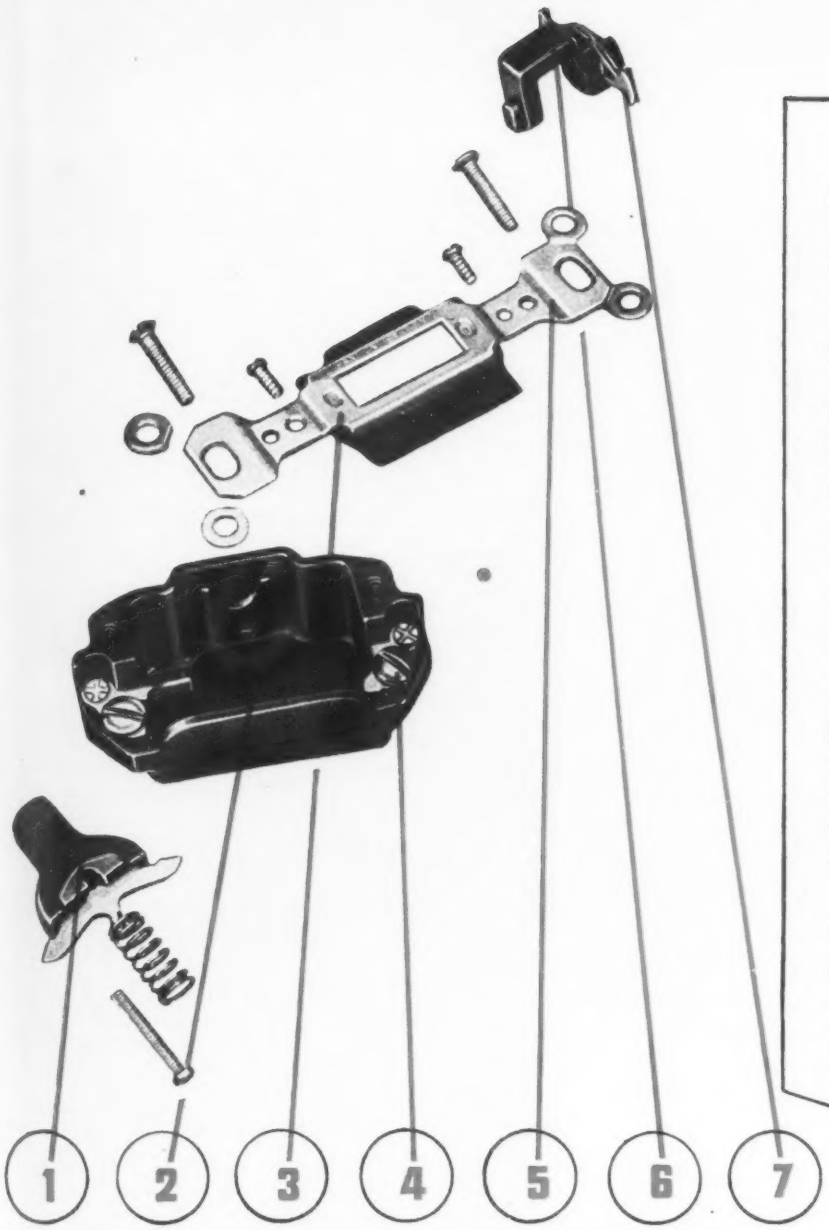
In addition, the use of this material reduces maintenance, because less attention and retightening is required. All along your lines, Oliver Static-Proof Hardware is a good investment.

Ask your Oliver representative about this important group of Oliver Pole Line Materials.

Full details are given in Oliver Catalog 43.

OLIVER IRON AND STEEL CORPORATION

SOUTH TENTH AND MURIEL STS. PITTSBURGH 3, PA.



G-E SWITCH FEATURES

1 Strong, tough, molded Textolite* trigger handles withstand abuse without breaking.

2 Textolite box resists breakage, oils, and corrosive atmospheres. It has much less bulk than porcelain, thus providing maximum room for wire.

3 The wide ear-type crossbar assures automatic adjustment and correct alignment of switch to mounting surface. The four corner projections break off to provide handy metal washers for bushing-up switch behind box mounting screws. Drive screws fasten crossbar securely without use of nuts. (Illustration shows two washers detached.)

4 Binding screws are upset to prevent falling out, and are large enough to accommodate No. 12 wire.

5 This switch is T-rated for 10 amp at 125 v, 5 amp at 250 v. It is approved by Underwriters' Laboratories, Inc.

6 The Textolite blade carrier is an outstanding feature of this switch; other switches, to our knowledge, have metal blade carriers. The use of Textolite eliminates the need for insulating fiber washers, which tend to swell or distort, causing switch failures. Textolite assures full insulating protection together with strength and stability.

7 The switch mechanism has phosphor bronze blades for lasting spring tension. Split blade design provides better contact than solid blade and split contact types. A compression-type actuating spring assures operation with minimum arcing and maximum spring life. Action of the blades is fast and positive.

**Trade-mark Reg. U. S. Pat. Off.*

IF IT'S **INNER STRENGTH** YOU'RE AFTER

LOOK AT THIS "INSIDE STORY" OF G-E SWITCH CONSTRUCTION

This exploded view shows the sturdy construction and compact design that make G-E standard switches the answer to any electrical maintenance man's prayer.

All parts are *built to last*. There are no weak links to cause early failure and frequent replacement. Even the handles are extra tough, to guard against breakage from careless blows.

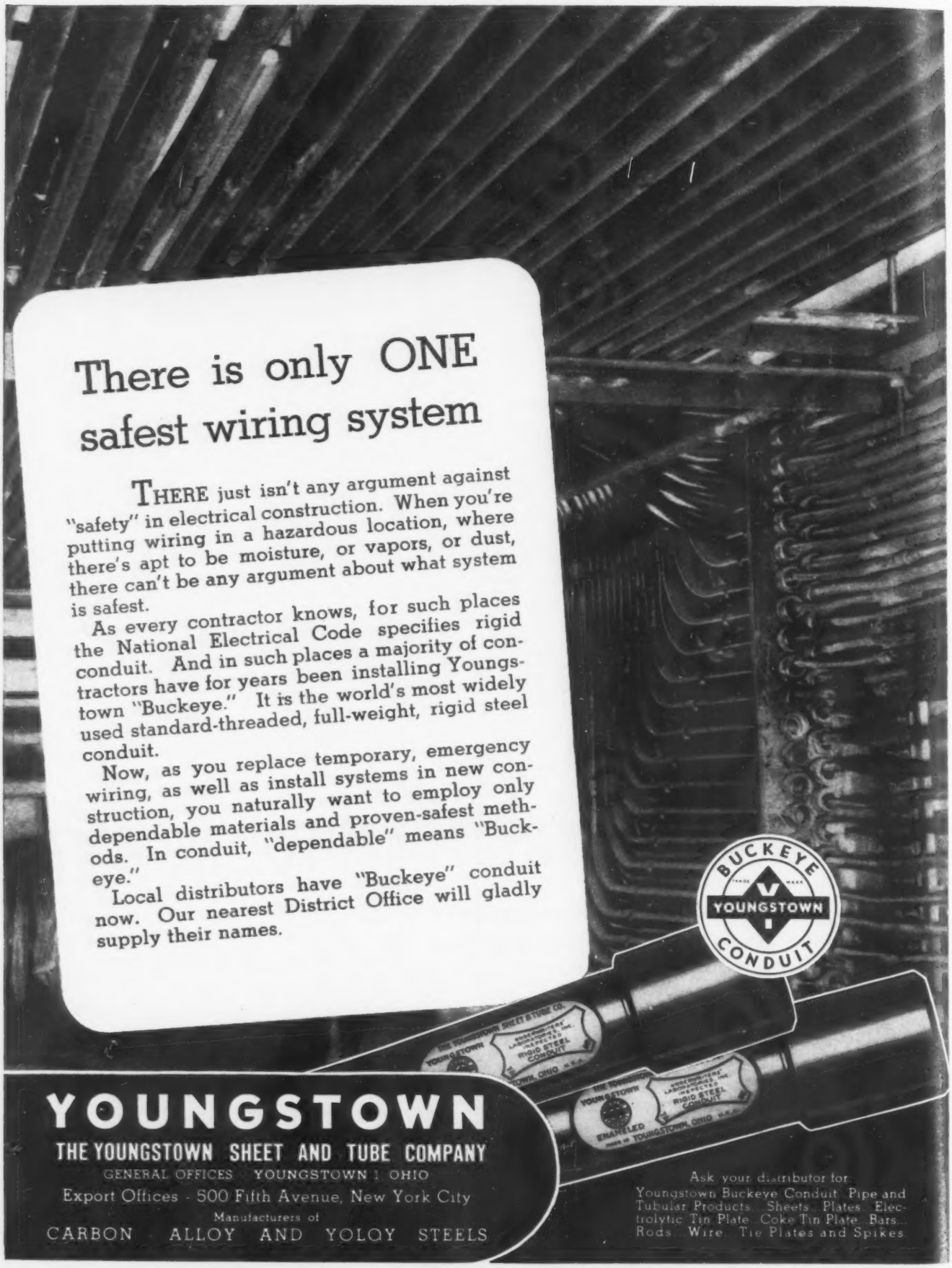
The switch illustrated here is a T-rated, fine-quality switch for standard, high-grade installations. G.E. makes a full line that includes all grades, as well as silent and special switches. Every G-E switch lives up to every claim made for it — and perhaps a little more, because we don't believe in skimping on quality.

Check the outstanding advantages listed in the panel above. Then, on your next installation, remember to use G-E switches — you'll be sure to get the best.

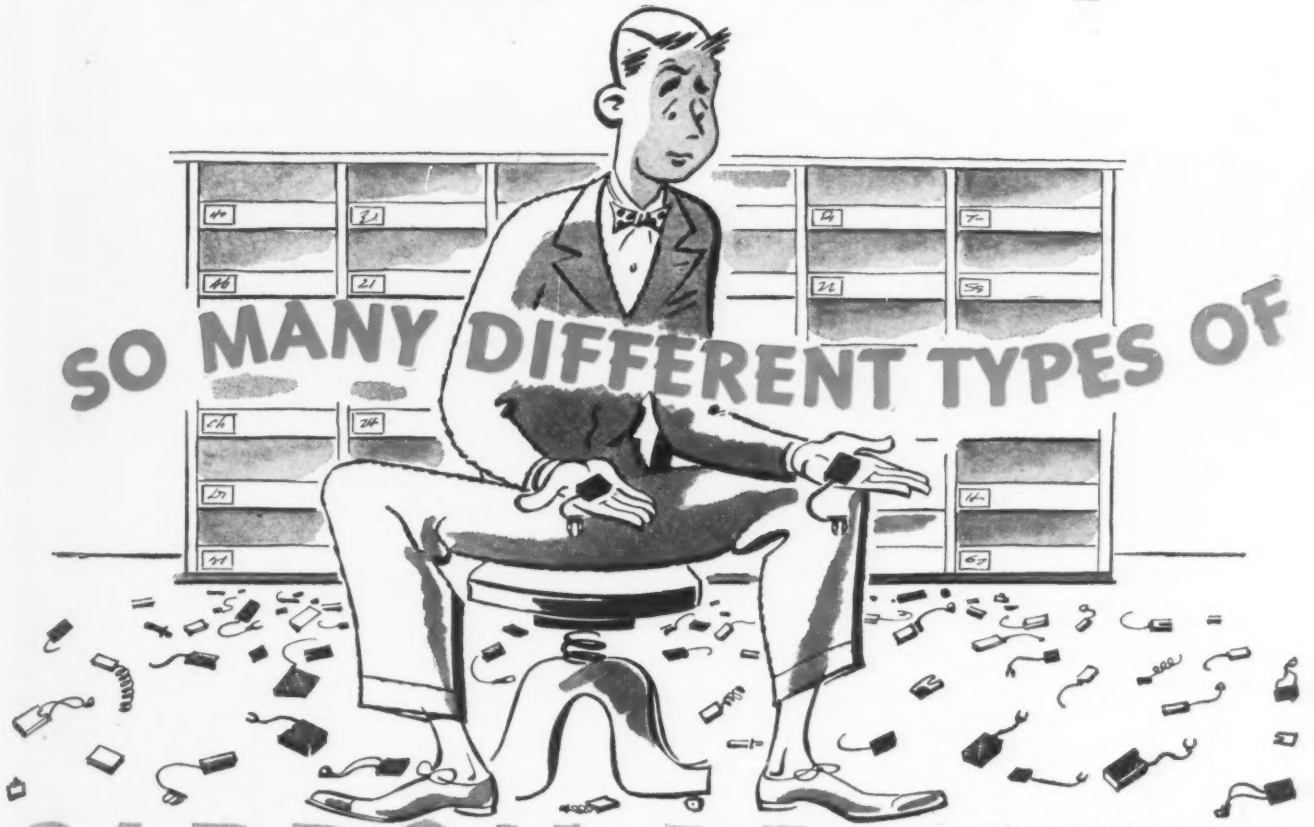
For information on the full line of G-E wiring devices, write Section D15-1118, Appliance and Merchandise Department, General Electric Company, Bridgeport 2, Conn.

GENERAL ELECTRIC

FOR SAFETY'S SAKE . . . USE CONDUIT *(Full Weight Rigid Steel)*


There is only ONE safest wiring system
THERE just isn't any argument against "safety" in electrical construction. When you're putting wiring in a hazardous location, where there's apt to be moisture, or vapors, or dust, there can't be any argument about what system is safest.
As every contractor knows, for such places the National Electrical Code specifies rigid conduit. And in such places a majority of contractors have for years been installing Youngstown "Buckeye." It is the world's most widely used standard-threaded, full-weight, rigid steel conduit.
Now, as you replace temporary, emergency wiring, as well as install systems in new construction, you naturally want to employ only dependable materials and proven-safest methods. In conduit, "dependable" means "Buckeye."
Local distributors have "Buckeye" conduit now. Our nearest District Office will gladly supply their names.
BUCKEYE
YOUNGSTOWN
CONDUIT
YOUNGSTOWN
THE YOUNGSTOWN SHEET AND TUBE COMPANY
GENERAL OFFICES YOUNGSTOWN 1, OHIO
Export Offices - 500 Fifth Avenue, New York City
Manufacturers of
CARBON ALLOY AND YOLOY STEELS
Ask your distributor for Youngstown Buckeye Conduit, Pipe and Tubular Products, Sheets, Plates, Electrolytic Tin Plate, Coke Tin Plate, Bars, Rods, Wire, Tie Plates and Spikes

DON'T BUY



CARBON BRUSHES

IT'S A FACT—you don't *need* to buy so many different types and sizes of motor and generator brushes! This has been established by surveys in various plants! A large steel company, for instance, discovered it could cut its brush items from 675 to 93. Another firm eliminated 2285 "necessary" brush sizes and shapes at substantial savings in ordering, billing, and in inventories.

Sponsored by National Carbon Company, Inc., this program of simplification of carbon, graphite, and metal-graphite brush needs can bring similar savings to you.

By making a few simple changes in present brush specifications, a comparatively few standard brush types and sizes will fill most of your varied needs.

HOW BRUSH SIMPLIFICATION PAYS:

1. Price advantage through quantity discounts.

2. Less money and space tied up in brush stocks.

3. Less time needed to handle stock.

4. Reduction of small orders—saving time in bookkeeping, billing, and accounting.

For further facts, get in touch with our nearest Division Office today. Dept. EW.

NATIONAL CARBON COMPANY, INC.

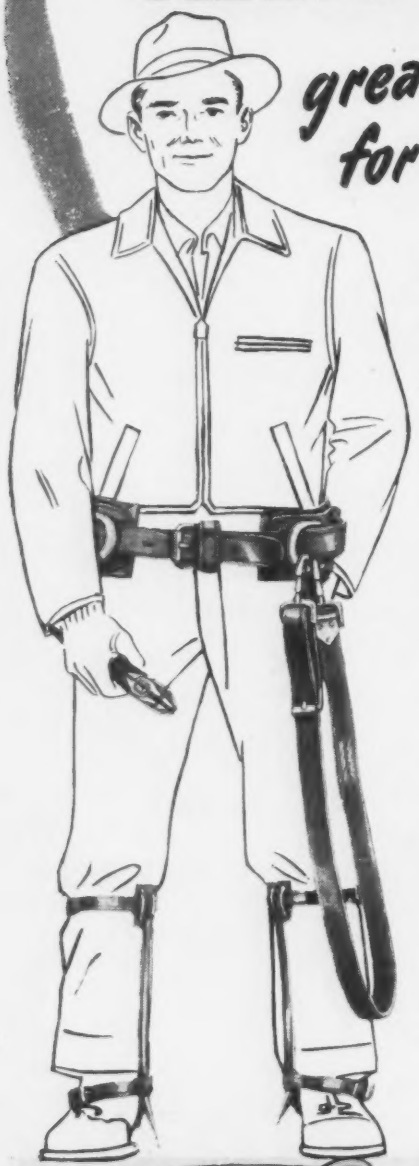
Unit of Union Carbide and Carbon Corporation
The word "National" is a registered trade-mark of National Carbon Company, Inc.

UCC

30 East 42nd Street, New York 17, N. Y
Division Sales Offices: Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco

KLEIN-KORD...

greater safety for LINEMEN!



Klein-Kord Safety Straps, developed more than ten years ago, are today used exclusively by many of the country's largest public utilities.

Multiple plies of long staple cotton of a special weave are vulcanized in rubber. This weave permits the use of a tongue-type buckle without risk of slipping or ripping, even under severe tension and excessive loads. The red center provides a warning signal. The strap is safe for use until worn down to the center ply—"Stop when you see red."

Klein-Kord is extremely tough, flexible, and of uniform thickness and strength. It has a low conductivity, will not stretch, and is unaffected by moisture.

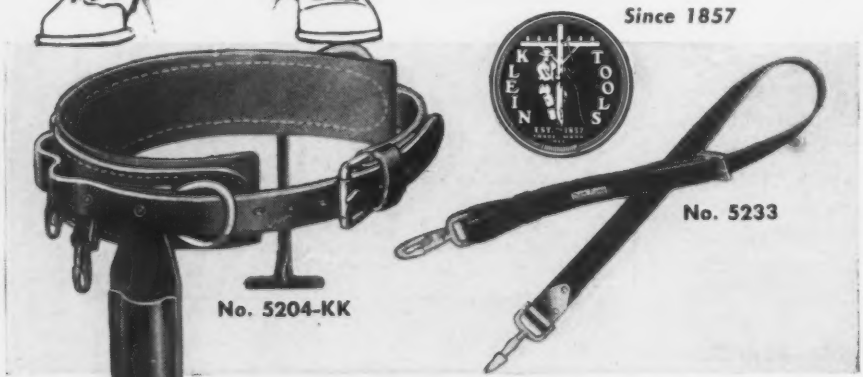
An improved Tool Belt of Klein-Kord is also available. This belt has found favor with linemen, and offers the quality features that have made Klein Belts the choice of linemen for generations.

Klein-Kord is an exclusive Klein development available only on equipment carrying the Klein trade-mark.

Foreign Distributor:

International Standard Electric Corp., New York

Since 1857



Write for folder giving information on Klein-Kord belts and safety straps.

Mathias KLEIN & Sons

Established 1857 — Chicago, Ill., U.S.A.

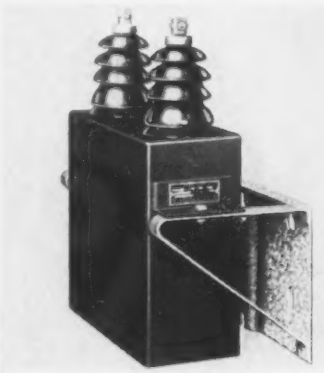
3200 BELMONT AVENUE, CHICAGO 18, ILLINOIS

PRODUCTS

that are news

Capacitors (1100)

A line of capacitors in the 2,400- to 13,800-volt range has been introduced by Line Material Co., which claims unusually long life characteristics for them. Unit stress is said to be more conservative; packs are wound in a temperature and humidity controlled room; drying and impregnating is by a new type oven (patent applied for); impregnation is with non-inflammable ELEMEX, claimed to have low electrical losses and high dielectric constant and strength. Packs are insulated from the tank by a method of staggered and overlapped multiple layers of paper together with wrapped and folded top and bottom surfaces. Welded tank of copper-bearing steel with recessed bottom; two-piece porcelain bushings elevated on high rain sheds; built-in discharge resistors are other features listed by the manufacturer.



Plastic Insulation (1101)

Textolite No. 1422, a plastic material claimed to have characteristics advantageous to ultra-high frequency insulating applications, has been announced by G-E. It is said to possess unusual heat resistance, the ability to be machined to close tolerances and to have a very low power factor with an ASTM heat distortion of 105 to 113° C. Tests indicate that, under the light loads commonly encountered in connector assemblies, the material will maintain its shape up to 200° C and, when fully loaded, will surpass the highest operating temperatures recommended for RG type coaxial cables. At this temperature, it does not flow but merely becomes flexible and, upon cooling, regains its normal rigidity, the company states.

Test Switch (1102)

A switch for switchboard device testing from the front of the board has been announced by Westinghouse. Designed with up to ten elements and rated at 250 volts, 30 amp., combinations of current and potential switches are included as required for the various types of instruments to be tested. According to the manufacturer, safety and accuracy are increased by constructing the switch so that a plug properly connected to the test instruments can be used to check from the front of the board in rapid succession, all meters or instruments of a particular type.

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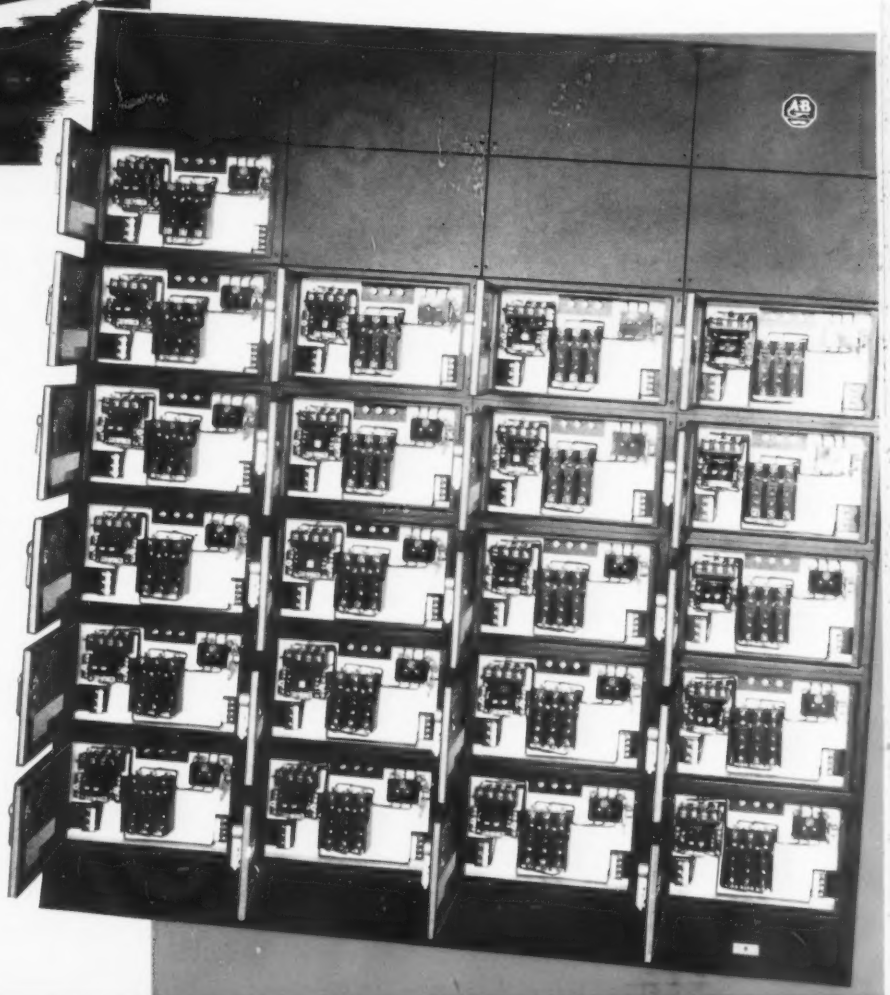
Modern Control Centers

Factory Built to your Exact Requirements

While the Allen-Bradley Multi-Unit Control Centers are custom built to your requirements, the individual control units are strictly catalog listed items. The job comes to you in a rugged self-supporting steel structure, all completely wired and tested—ready to install. You save installation time, eliminate installation delays, and are assured of a first-class professional job which is decidedly attractive in appearance. And the cost is usually less than the total cost of installing individual starters. Write for full information. Allen-Bradley Company, 1316 S. Second St., Milwaukee 4, Wis.



CENTRALIZED OPERATION

Motor control for a group of machines or for the entire plant is centralized in one point for convenient operation and inspection.

LOWER INSTALLATION COSTS

Special foundations or supporting structures are unnecessary. As all internal wiring is completed, the installation cost of the Multi-Unit Control Center is a fraction of the cost of installing individual units.

GREATER SAFETY

Buses and wiring are completely enclosed. Centralized location of all controls prevents tampering by unauthorized personnel. The Multi-Unit Control Center can usually be located away from dusty, corrosive or explosive atmospheres.

CLEAN MODERN APPEARANCE

Grouping starters in one convenient location saves space on individual machines, saves floor space in the plant, and provides a smart appearing job. Investigate Multi-Unit Control Centers—the modern method of installing motor control.

ADAPTABLE TO PLANT CHANGES

Multi-Unit Control Centers can be moved as a unit without changing the internal wiring, thus simplifying future changes in plant layout. Space can also be provided in the Control Center enclosure for future additions.

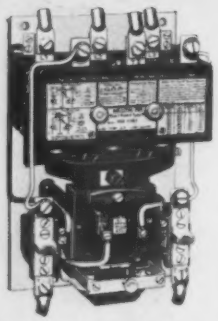
A-B Quality

ALLEN-BRADLEY

QUALITY

MULTI-UNIT CONTROL CENTERS

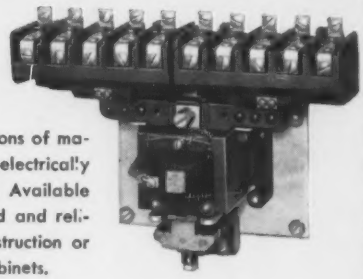
Trouble-Free
SOLENOID CONTROL UNITS
For Your Special Control Panels



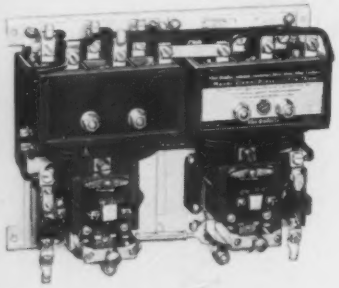
Bulletin 709 ACROSS-THE-LINE STARTERS

Designed for across-the-line starting of polyphase squirrel cage motors. Two thermal overload relays protect the motor from damage due to sustained overloads. Good for millions of trouble-free operations.

Bulletin 702 SOLENOID CONTACTORS



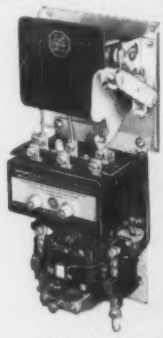
For controlling the various motions of machine tools and in all kinds of electrically operated mechanical equipment. Available in from one to ten poles. Rugged and reliable. Provided in the open construction or with several types of enclosing cabinets.



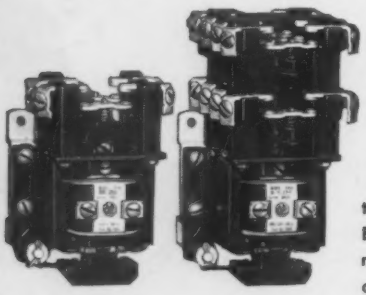
Bulletin 705 REVERSING SWITCHES

For automatically starting and reversing two- and three-phase squirrel cage and certain single-phase motors. Simple, reliable, mechanical contactor interlock.

Bulletin 712 DISCONNECT SWITCH TYPE COMBINATION STARTERS



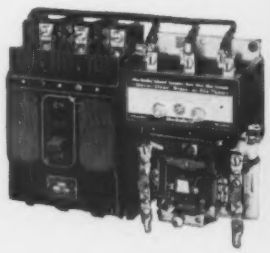
A manual disconnect switch also provided with silver alloy contacts and a solenoid type across-the-line starter mounted on a common base plate. These starters offer greater safety, require less space, and cost less to install than a separate starter and disconnect switch. Results in a more attractive job.



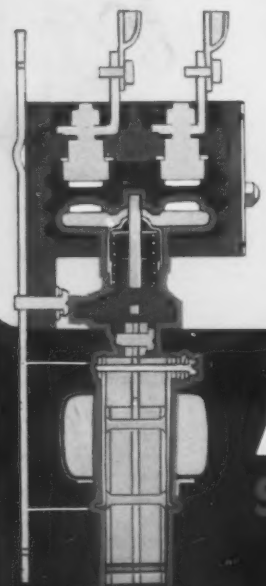
Bulletin 700 SOLENOID RELAYS

Small and inexpensive, but extremely rugged and trouble-free. Built with from one to 12 poles in many different types. Remarkably consistent in operating speed.

Bulletin 713 CIRCUIT BREAKER TYPE COMBINATION STARTERS



Consist of a solenoid type across-the-line starter and a magnetic trip ITE circuit breaker for short circuit protection. Furnished in the open construction or with several types of enclosures.



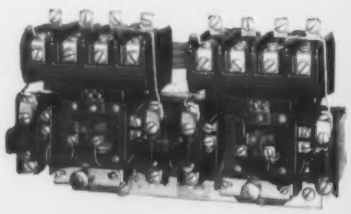
Cut-away view of Allen-Bradley solenoid starter.

Only ONE MOVING PART in these Solenoid Starters

All of the controls listed on this page utilize the simple and trouble-free Allen-Bradley solenoid mechanism. They have no hinges, pivots, or bearings to cause variations in time of operation. All have double break, silver alloy contacts that require no maintenance. Write for information.

ALLEN-BRADLEY COMPANY
1316 S. Second St., Milwaukee 4, Wis.

Bulletin 715 MULTI-SPEED STARTERS



Designed for the remote control of 2, 3, and 4 speed squirrel cage motors of either the consequent pole or separate winding types. Consist of two or more magnetic contactors, each equipped with two thermal overload relays.

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL

QUALITY

A-B Quality

Autopot (1103)

A portable self-balancing potentiometer has been added to the G-E line. According to the announcement, d-c voltages as low as 10 microvolts and up to 1 volt can be measured with any indicating or recording instrument drawing up to 5 ma. and having a resistance of 1,500 ohms or less. The unit is said to extend the range of conventional indicating and recording instruments so that they can be used for high-sensitivity measurement of low d-c voltages and direct currents. The unit is completely self contained, weighs 5 lb.

At balance, the current drawn by the input circuit is 0.01 microamperes; output is 5 ma. full scale for any input range and any output-instrument circuit resistance up to 1,500 ohms. Ranges of input voltages: 100 microvolts d-c full scale to 1 volt d-c full scale, in decade steps obtained by standardized plug-in type resistors. The potentiometer balances to plus or minus 1 microvolt; over-all accurancy depends upon the output instrument used. Response time is 1 sec. on the 200-microvolt range and less than 1 sec. on higher ranges.

Dilatometer (1104)

Sylvania has announced an improved automatic dilatometer for continuous recording of the thermal expansion and contraction of a wide range of materials, including metals, glass, ceramics and plastics. The instrument provides for a 12-hour graphic recording cycle, and measurements begun in the afternoon may be completed automatically overnight. Three-, four- or five-inch specimens and temperatures up to 1,000° C are provided for in the instrument, which weighs 450 lb., measures 56 in. wide, 50 in. high, 26 in. deep. It is designed for 110-120 volts, 50-60 cycle supply and is rated at 900-1,000 watts.

Motor Line (1105)

Principally by using steel to replace cast-iron frames, Westinghouse has reduced size by 35% (while retaining NEMA standard dimensions), in a new series of motors, called the Life-Line. Westinghouse also states starting torques have been increased 134% per lb. of motor, and maximum torque 116% per lb., while electrical properties have not been sacrificed and maintenance properties have been considerably improved. Many other features are incorporated in the new designs, and extensive interchangeability of parts is expected to improve deliveries of various types.

Carburizing Furnaces (1106)

G-E has announced a line of electrically heated, cylindrical, gas carburizing furnaces with maximum temperatures of 1,800° F. These furnaces feature rapid and uniform distribution of carburizing gas throughout the charge through use of a fan located on the furnace cover. There are three furnaces in the line, rated at 59.5, 77.5 and 110 kw.

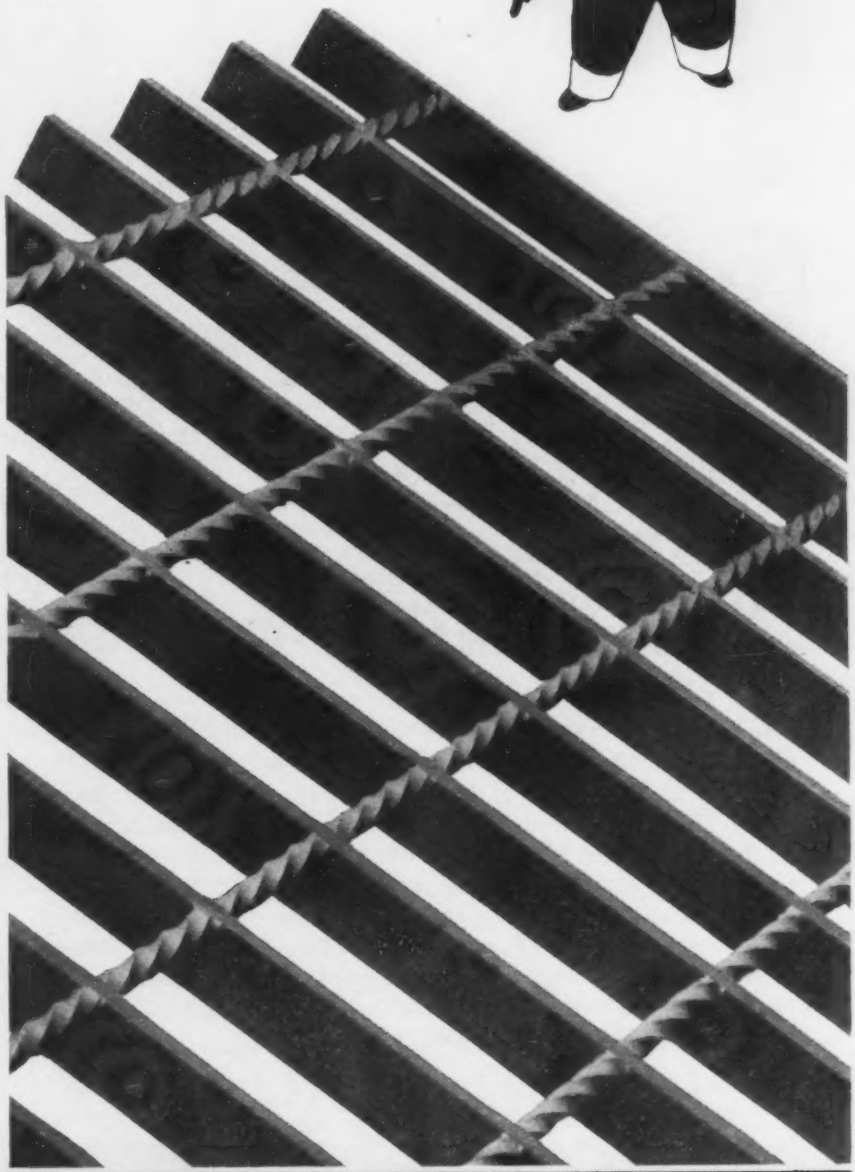
Insulators (1107)

Electronic Mechanics Inc. are making Mykroy feed-through insulators and high-voltage transformer bushing. The insulators are available in a size range of ¾ to 5 in. They are produced by injection molding to precision tolerances and, according to the manufacturer, have uniformly flat shoulders free of high-pressure spots. Nuts and studs are cadmium plated.

See how the design of Blaw-Knox Electroforged Steel Grating permits maximum entrance of light and air . . . makes it easy to clean or paint . . . no bolts or nuts to rattle. Made for all floor loads.

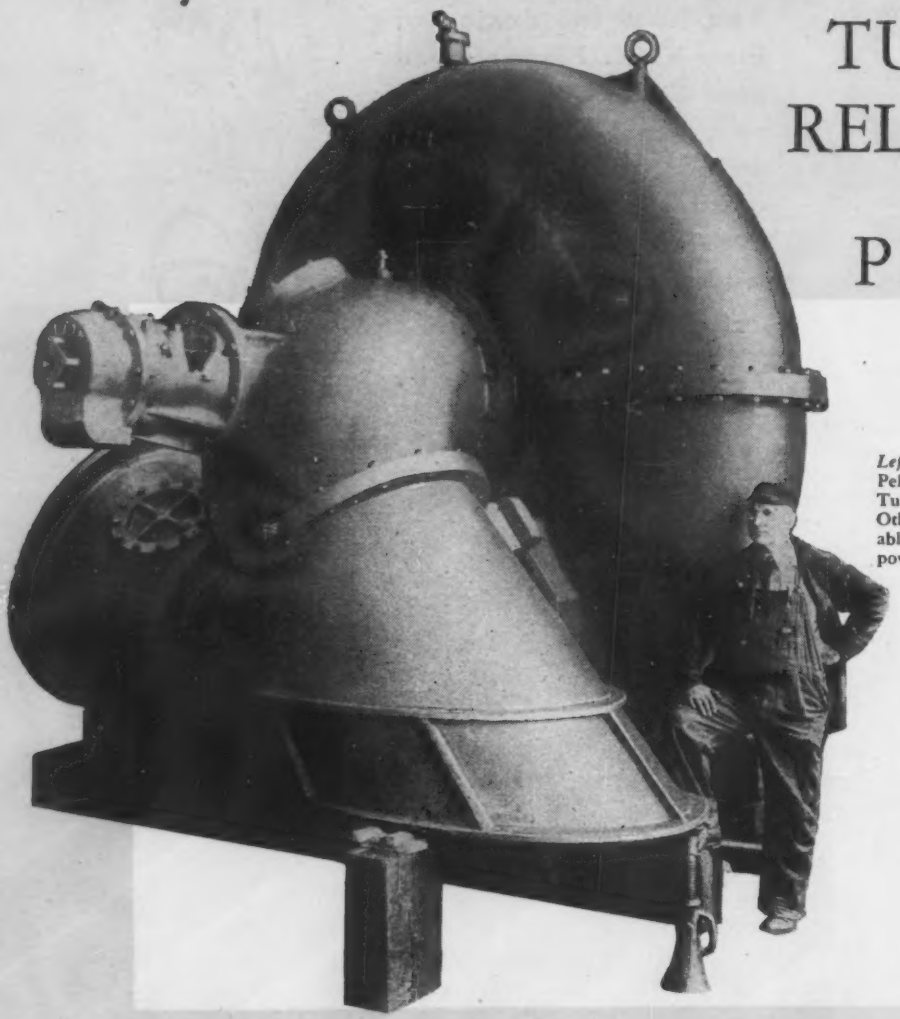
BLAW-KNOX DIVISION
OF BLAW-KNOX COMPANY
2098 FARMERS BANK BUILDING
PITTSBURGH 22, PA.

"Look in there"



BLAW-KNOX ELECTROFORGED STEEL GRATING

When you want YEARS of HYDRO-ELECTRIC TURBINE RELIABILITY, *consult* PELTON



Left: Shop Assembly View of Pelton Horizontal Reaction Turbine, 1400 hp., 400 r.p.m. Other Pelton Turbines available from fractional horsepower to 70,000 hp.

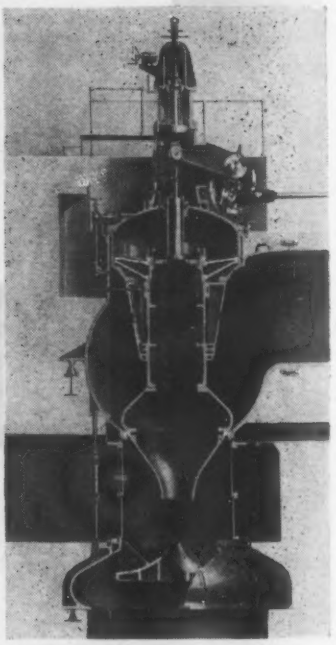
—here is Assurance of Full Horsepower at any given site

Pelton hydro-electric turbine runners have been known to spin generators almost continuously for 35 years before replacement!

That's because Pelton engineers know all the *do's and don'ts* of 66 years of turbine design, materials and precision construction. Such vast knowledge, plus constant laboratory tests, is applied to *engineering the right design* for the particular water conditions existing at the installation site. Careful study does assure *maximum horsepower* development and helps utilities offer *more electricity per dollar*

Pelton builds the turbines in their own shops where modern machine tools and skilled "old timers" know how to construct large and small turbines properly for world-wide use.

Consult Pelton for reliable turbines which develop power at sustained high efficiency.



SAFETY VALVE FOR HYDRO-ELECTRIC PLANT

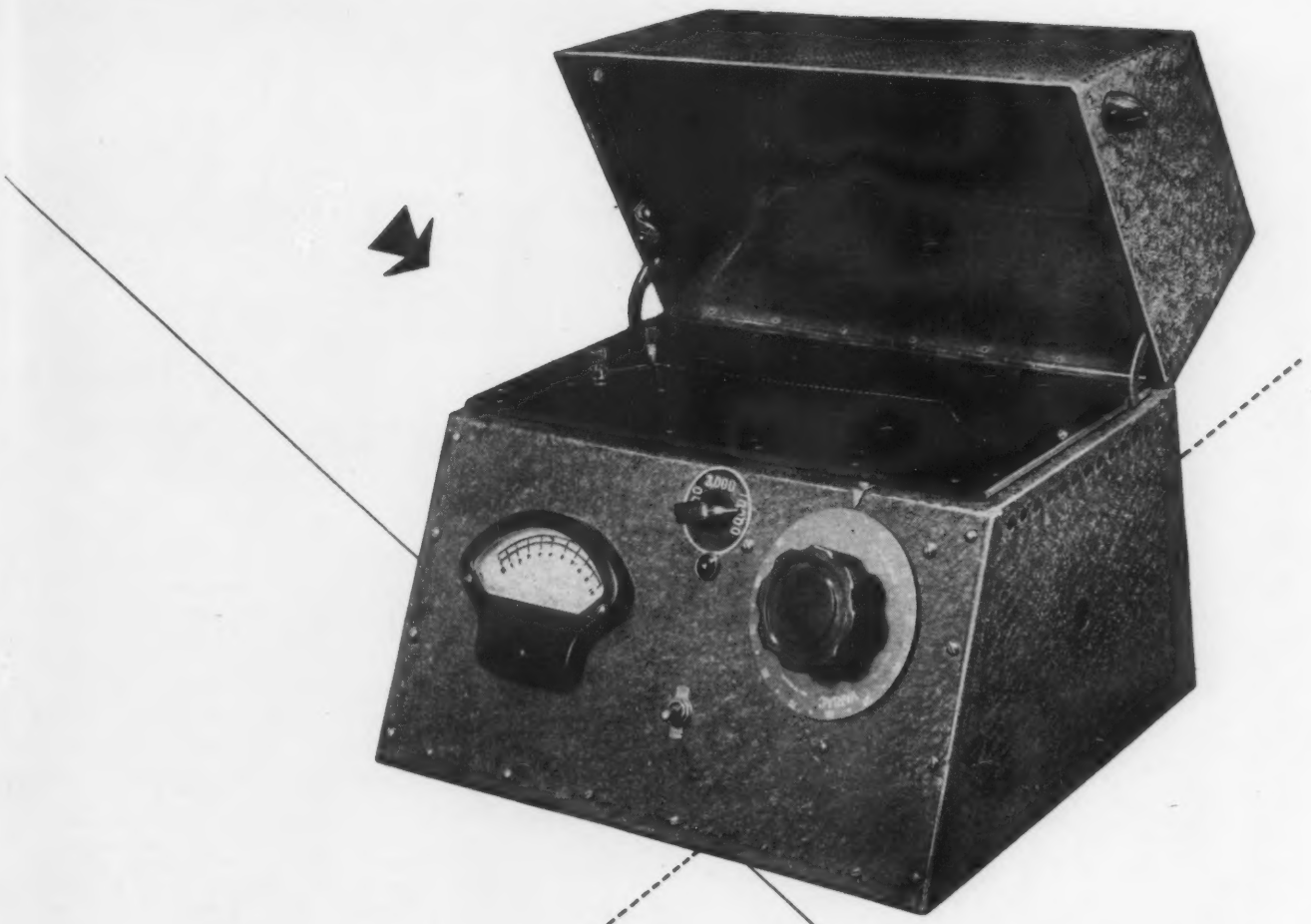
Pelton builds a number of types of huge water control valves. The above 450,000-gallons-per-minute *Pressure Regulator* bypasses water not needed by the turbine when the electrical output is interrupted. It thereby protects the penstock against surges and safeguards other equipment.

BLW THE BALDWIN GROUP

The PELTON WATER WHEEL Company

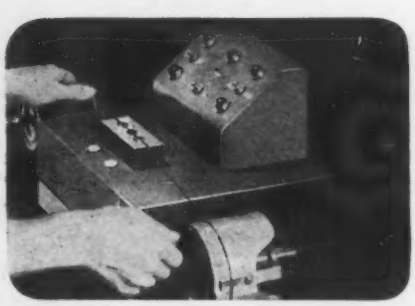
Subsidiary of The Baldwin Locomotive Works

2929 NINETEENTH STREET • SAN FRANCISCO 10, CALIF.



A LITTLE "POWER HOUSE"

that checks uniform enameling of Essex *EXTRA-TEST* Magnet Wire



Equally important, Essex Magnet Wire is spot checked each day by means of this mercury-bath test. Pin-hole breaks and film continuity are thus determined—enabling production engineers to maintain constant control of the variables which often cause poor insulating films.

Essex Magnet Wire from each day's run is subjected to severe dielectric tests in this little "power house"—operating range, 0 to 10,000 volts!

Two wires—twisted together to make a continuous-surface enamel film contact—are attached; then voltage is applied, and gradually increased until insulation fails. This automatically shuts off the machine, indicating exact voltage at which breakdown occurred.

Such tests enable Essex engineers to maintain close control of the enamel's desirable insulating characteristics—your assurance of safe, dependable insulation and maximum dielectric strength, when you specify Essex *Extra-Test* Magnet Wire for coil winding.

ESSEX WIRE CORPORATION
FORT WAYNE 6, INDIANA

WIRE SX PRODUCTS

Plants: Fort Wayne, Indiana; Detroit, Michigan; Anaheim, California

Warehouses* and Sales Offices: *Atlanta, Ga.; *Boston, Mass.; *Chicago, Ill.; Cleveland, Ohio; Dayton, Ohio; *Detroit, Michigan; Kansas City, Mo.; *Los Angeles, California; Milwaukee, Wisc.; *Minneapolis, Minn.; *Newark, N.J.; Philadelphia, Pa.; *San Francisco, Calif.; *St. Louis, Mo.

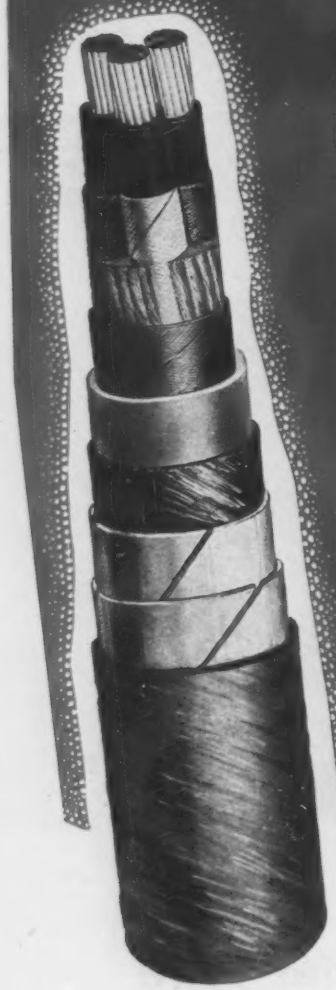
• MAXIMUM PROTECTION AND LONG LIFE •

CRESCENT

Steel Taped

PARKWAY CABLE

in all voltage ranges from 600 to 5000-V with rubber insulation —600 to 15,000-V with varnished cambric insulation For direct earth installation



TYPE RLJFJ
THREE CONDUCTOR

•

Also all standard types of metallic Parkway cables, to I. P. C. E. A. specs. Special cables to customer's specifications.

NO other protection required except at points of extreme mechanical hazard. Being well protected from ordinary mechanical injury and easy to install, they provide an economical, permanent underground system.

These cables are widely used for street lighting circuits, railroad yard lighting and signal systems, airport power and lighting circuits and in industrial plants and mines.

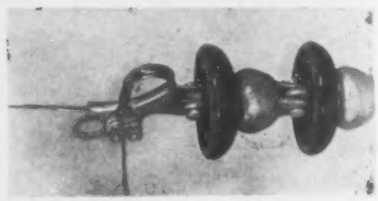
CRESCENT INSULATED WIRE & CABLE CO.
TRENTON, N. J.

CRESCENT WIRE & CABLE

NEMA

Clamp (1108)

Brewer-Titchener Corp.'s No. 2106 conductor strain clamp employs a new manufacturing method, according to that company. Of the snail-shell snubbing type, the new clamp is pressed from heavy-gage steel, has a one-piece body. It is said to be especially suited for dead-ending rural and distribution line conductors, and handles a range of cable sizes from minimum of 0.160 in. to maximum of 0.366 in. Other



features listed in the manufacturer's announcement: light weight and short connecting length, which minimizes effects of cable vibration; adequate ultimate and slip strength; large snubbing radii; smooth die-form cable seat and long clamping section to prevent conductor damage. A come-along loop is provided and only one clamping bolt need be removed and only one wrench used in installation, it is stated.

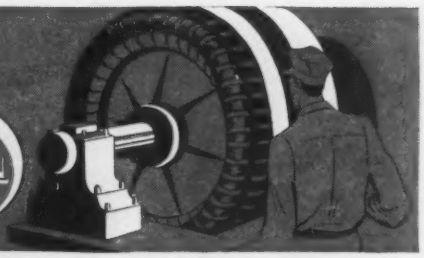
Transformer Gin (1109)

A transformer gin for hoisting small distribution and rural line transformers, circuit breakers and reclosers in pole mounting has been developed by A. B. Chance Co. This gin may be mounted on wood or steel poles and is held securely by a specially designed chain tightener, locked in place with a safety latch. The hard wood mast is laminated for extra strength. The tool is said to be light weight, is rated to lift 1,500 lb. maximum load.

Troffer Knock Outs (1110)

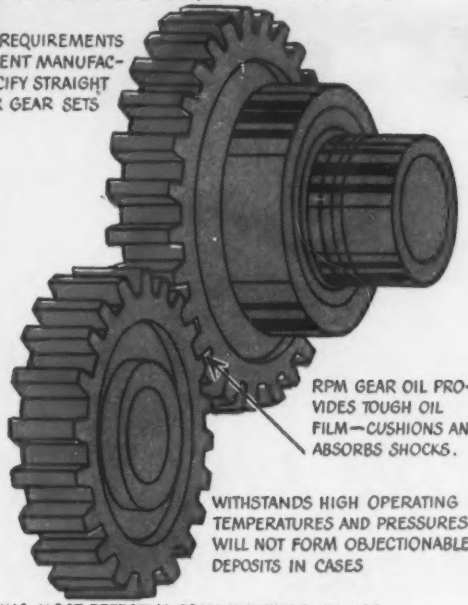
Guth recessed troffers feature special knock outs which permit lampholders to be inset flush with the outside surface of the closed ends, thus requiring no more ceiling length than the 48 in. length of F lamp and holders. These troffers are built as complete units. Accessories include baffles, two types of eggcrate louvres and both flat and formed-glass panels; attachment features built into the troffers permit interchange. Deep types are available for one, two or three 40-watt lamps and shallow types for one or two 40-watt lamps.

STANDARD ENGINEERS NOTEBOOK



RPM GEAR OIL IS A HIGHLY STABLE, STRAIGHT MINERAL OIL.

MEETS GENERAL REQUIREMENTS OF GEAR EQUIPMENT MANUFACTURERS WHO SPECIFY STRAIGHT MINERAL OIL FOR GEAR SETS



RPM GEAR OIL PROVIDES TOUGH OIL FILM—CUSHIONS AND ABSORBS SHOCKS.

WITHSTANDS HIGH OPERATING TEMPERATURES AND PRESSURES—WILL NOT FORM OBJECTIONABLE DEPOSITS IN CASES

·CONTAINS MOST EFFECTIVE FOAM INHIBITOR KNOWN

Straight mineral oil meets gear-maker requirements

To meet the need for a high-quality lubricant for certain transmission gears and other gear sets where a straight mineral oil is recommended, RPM Gear Oil was developed. It is made from the finest paraffinic lubricating oil stocks.

RPM Gear Oil deposits a tough lubricant film on gear teeth and bearings that prevents metal-to-metal contact in all operating conditions. It cools the surfaces and carries away heat. It extends gear and bearing life.

Because RPM Gear Oil is extremely stable, it minimizes trouble from objectionable deposits forming in cases. It eliminates foaming trouble because it contains the most effective foam inhibitor known.

RPM Gear Oil is made in three viscosity grades: SAE 90, 140, and 250. One of these grades will flow freely over gears and their bearings in every atmospheric temperature condition.

Wheel Bearing Grease absorbs road shocks

To assure safe, long-lasting lubrication in any type of automotive wheel bearing on passenger cars, trucks or busses, use RPM Wheel Bearing Greases.

Specially made for one particular purpose, RPM Wheel Bearing Grease will withstand the thousands of shocks that pound wheel bearings in every mile of travel. It has the unusual ability of absorbing the force of these shocks. This quality prevents overheating and metal fatigue and often extends the lives of bearings when they are properly adjusted and lubricated regularly.

RPM Wheel Bearing Grease will not melt or throw out unduly in extreme heat. And it stays soft and lubricates correctly in cold weather. Water-resistant, it aids in sealing out moisture, dirt and grit.

Write for free booklets which give complete information on RPM Wheel Bearing Grease and the correct servicing procedure for wheel bearing lubrication. There's one on light and one on heavy-duty equipment.

RPM WHEEL BEARING GREASE FORMS RESILIENT LUBRICANT FILM ON BEARINGS — ABSORBS FORCE OF ROAD SHOCKS

MADE FOR ALL TYPES OF BALL AND ROLLER WHEEL BEARINGS

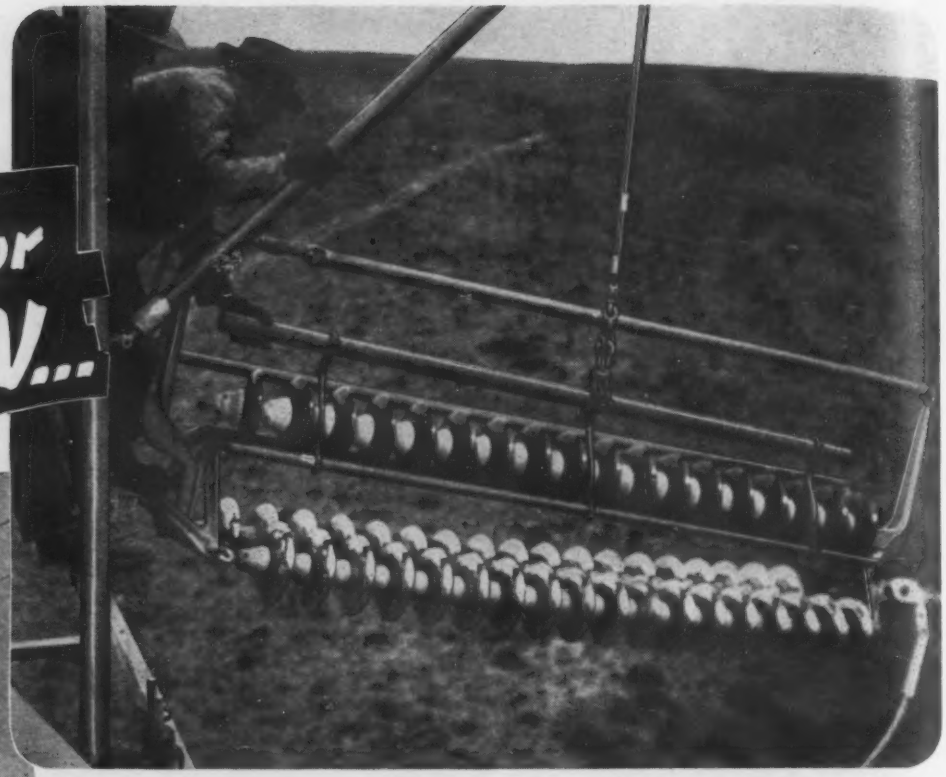
RPM WHEEL BEARING GREASE SEALS OUT WATER, DUST AND GRIT—STAYS PUT UNDER OVERLOADS

WITHSTANDS EXTREME PRESSURES, WILL NOT RUN OUT OF BEARINGS AT HIGH TEMPERATURES

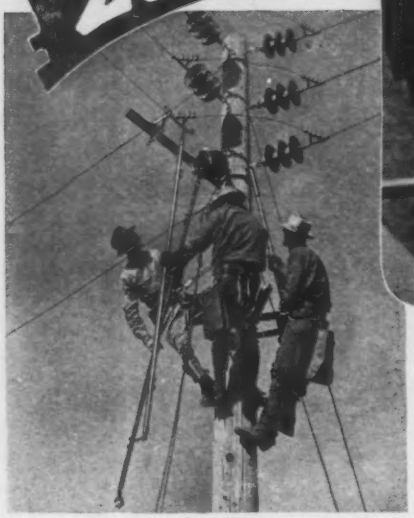
SPECIAL BARREL-TYPE WHEEL BEARING USED IN CHEVROLET COE TRUCKS

Standard Fuel and Lubricant Engineers are always at your service. They'll gladly give you expert service—make your maintenance job easier. Call your local Standard Representative or write Standard of California, 225 Bush St., San Francisco 20, California.

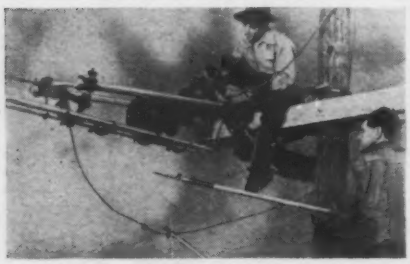
FOR EVERY NEED A **STANDARD OF CALIFORNIA** JOB-PROVED PRODUCT



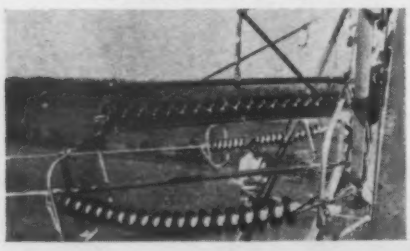
7.5 KV or 230 KV...



Dead end insulators on poles or crossarms (up to 16 KV) can be changed in a matter of minutes with this handy dead end tool.



For higher voltages use the above two-pole strain carrier and cradle combination for single strings. The single pole strain carrier below is made to handle double insulator strings.



DEFECTIVE INSULATORS are replaced HOT with CHANCE (TIPS) TOOLS!

The illustration above shows how Bonneville maintenance crews quickly replace damaged insulators on the 2700-mile, high-voltage Bonneville-Grand Coulee system. One single-circuit dead end tower has six triple string insulator assemblies, or a total of eighteen strings of eighteen insulator units each. With Chance (Tips) Tools, a single crew changes all insulator strings on a tower in 12 hours actual working time.

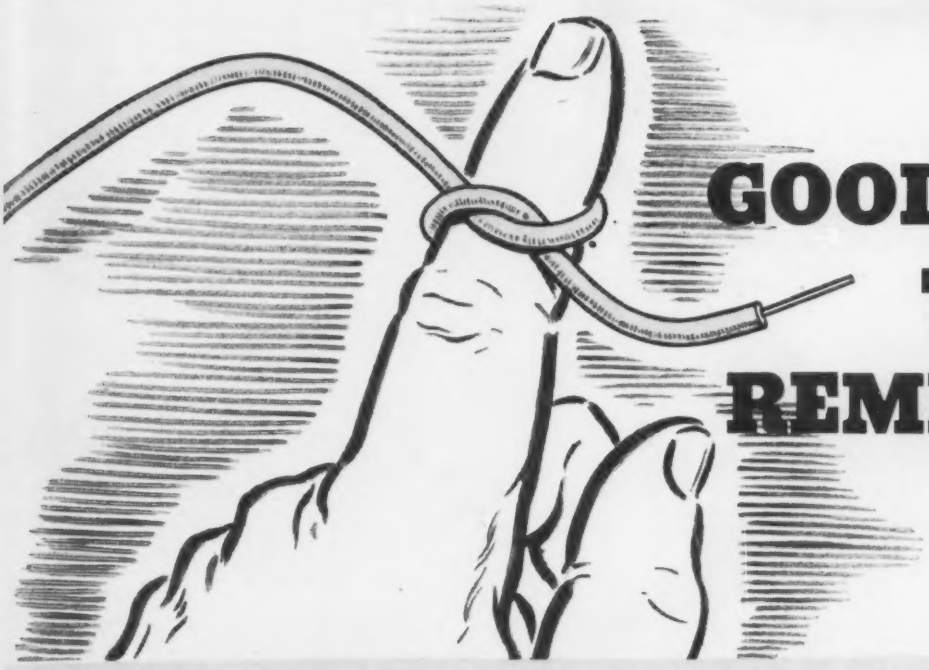
Whether *your* line maintenance problem is large or small... whether you service thousands of miles of high-voltage circuits or a small rural line, Chance (Tips) Tools make it possible to replace dead end insulators without interrupting service, and with utmost simplicity and safety.

All Chance (Tips) Tools are tested to withstand 75,000 volts per foot of pole. They are available for all types of live line maintenance.

C4613

A·B·CHANCE CO·
CENTRALIA, MISSOURI.
SAN FRANCISCO, CALIFORNIA

ABC INDUSTRIES



A GOOD NAME TO REMEMBER

ROME SYNTHINOL*

EASY PULLING
EASY STRIPPING
SMALL DIAMETER
HIGH DIELECTRIC STRENGTH
HIGH INSULATION RESISTANCE
WATER RESISTANT
WIDE COLOR RANGE
ABRASION RESISTANT
ACID RESISTANT
COLOR STABILITY
TENSILE STRENGTH
SOLVENT RESISTANT
FLEXIBILITY
FLAME RESISTANT
TOUGHNESS
LONG LIFE

ADEQUATE WIRING SERVES AND SAVES

ROMEY SAYS—
"All these features add up to a mighty fine product."

With thermoplastic insulation, small diameter Rome Synthinol* Types T and TW building wires provide many advantages for general purpose wiring.

Type T is approved by the Underwriters' Laboratories for use in new wiring as well as rewiring of existing raceways under the rules of the new National Electrical Code.

Type TW is approved by the Underwriters' Laboratories for use in wet locations under the rules of the new National Electrical Code.

Both types are regularly furnished in black, white, red, green, yellow, blue, orange and brown.

*Trademark Registered

FROM BAR TO FINISHED WIRE

ROME CABLE CORPORATION

ROME · NEW YORK

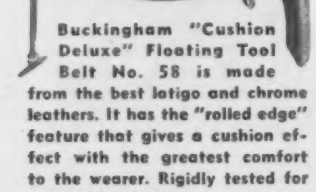
For more than 45 years the famous STEPHENS Climbers have been exclusively manufactured by

Buckingham

of Binghamton

and in that time one objective has been constantly kept in mind—to maintain the same high quality standards established by Wilmot Stephens when he first forged climbers on a blacksmith's anvil almost a half century ago.

Extreme care is taken to provide safe, comfortable equipment, and every article is inspected to comply with the exacting requirements established by safety engineers.



Buckingham "Cushion Deluxe" Floating Tool Belt No. 58 is made from the best latigo and chrome leathers. It has the "rolled edge" feature that gives a cushion effect with the greatest comfort to the wearer. Rigidly tested for strength and safety.

Here's Why Buckingham Climbers are Safer — More Comfortable!

- Shank a perfect fit, shaped for comfort.
- Wide standing surface slightly rounded to fit foot.
- Round loop will not cut straps.
- Gaff is hammer-forged from special tool steel, set straight with body of climber and close to foot-piece, giving least strain to climber, and maximum comfort to lineman.
- Each climber tested for toughness and strength of gaff rivet.
- Each climber Parkerized (rust proofed) and lacquered.

BUCKINGHAM MANUFACTURING CO., INC.

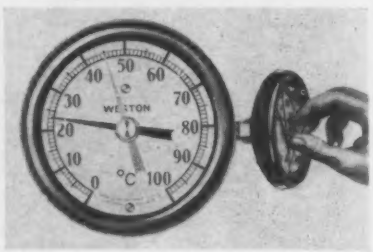
Walter E. Craw, President 5-7 Travis Street, Binghamton, N. Y.

Pacific Coast Distributor: The Western Hardware & Tool Company

Ninth and Mission Streets San Francisco 3, California

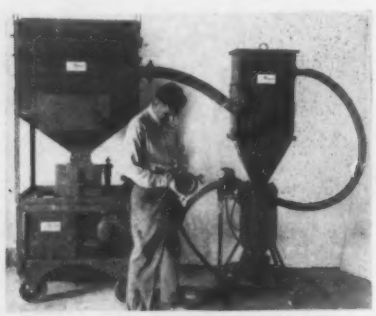
Max-Min Thermometer (1111)

Weston has introduced an all-metal thermometer indicating maximum or minimum temperatures reached. This Max-Min thermometer is similar to the standard Weston all-metal thermometer but has in addition an auxiliary red index which is manually set for highest or lowest recording. It is available in two models, 221M and 222M, with scale diameters of three and five inches respectively, in all the usual Weston ranges and in stem lengths from 2½ to 48 in.



Vacu-Blaster (1112)

Vacu-Blaster is a machine which confines the abrasive used in blast cleaning to the immediate work area. This is accomplished by combining blast and vacuum pick-up in a single "nozzle," which is operated much like a household vacuum cleaner extension. Manufacturers state the vacuum pick-up is so positive that precision machinery, food, etc., may be left adjacent to an operating Vacu-Blaster without harm. Many abrasives may be used. Vacu-Blast Co. Inc., makes this product.



Multibreaker (1113)

The MO-4 multibreaker, an improvement of the MO-2, has been announced by Trumbull Electric Mfg. Co., for protection of four single-phase circuits or less. This unit has both automatic overcurrent and short-circuit protection for branch circuits and is in the form of a circuit breaker with combined thermal and magnetic characteristics claimed to give greater speed in tripping. It is made to protect circuits of 10 and 20 amp., plus 30 amp. (to conform with the new Code wire ratings effective Nov. 1, 1946).

MORE REVENUE LESS MAINTENANCE

BY PROTECTING LINES WITH

KYLE

OIL CIRCUIT RECLOSERS

Use of Kyle Automatic Oil Circuit Reclosers increases revenue by automatically keeping more lines in service more of the time.

Temporary faults . . . 90% of line outages . . . are cleared automatically. When a permanent fault occurs, the line outage is restricted to the smallest possible area.

This automatic clearing of temporary faults saves manpower, wear and tear on trucks and equipment, tires and gasoline by eliminating all but the most essential service trips. Regular work schedules are not interrupted.

Continuity of service which Kyle Reclosers provide increases customer satisfaction. Use of three-phase reclosers on three-phase lines protects motors and other electrical equipment. Better service brings more customers, larger power loads.

KYLE TYPE "3H" FOR THREE-PHASE LINES

The Kyle Type "3H" Automatic Oil Circuit Recloser provides effective, practical and economical protection for three phase rural distribution systems.

It is a practical combination of three single pole units interconnected in such a way as to permit single phase operation of any of the units so long as no lockout is required. When one unit locks out, the other two lock out simultaneously.

Dangerous "single phasing", with attendant overloading and burning out of three phase motors is minimized by their use.

ONLY KYLE GIVES YOU DUAL OPERATING CHARACTERISTICS

Both Kyle Type "3H" and Kyle Type "H" Reclosers employ the Kyle trouble-free, long-life, hydraulic timing mechanism. There are no motors or clockwork mechanisms to get out of order. Both give you the Kyle-originated dual operating characteristics:

ONE: Fast opening of the recloser on the first and second operations. This automatically clears all temporary line faults.

TWO: Time-delay opening of the recloser on the third and fourth operations. This allows sectionalizing fuses to blow before the recloser locks out on the fourth operation.

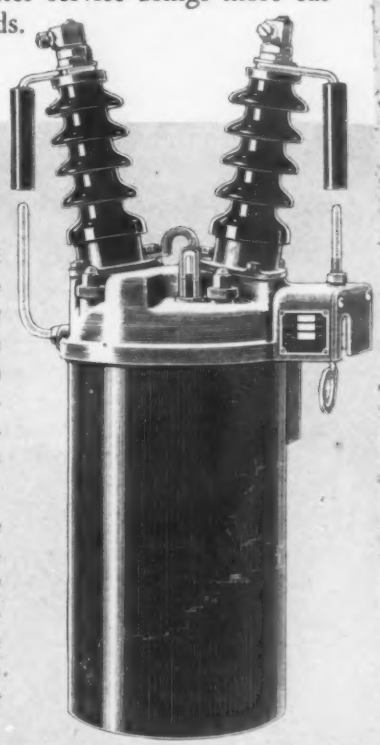
Ask Your Line Material Representative

Kyle line protection equipment is sold by branches and representatives of the Line Material Company. They will be glad to assist you in securing the utmost in automatic line protection.

KYLE TYPE "H" FOR SINGLE PHASE LINES

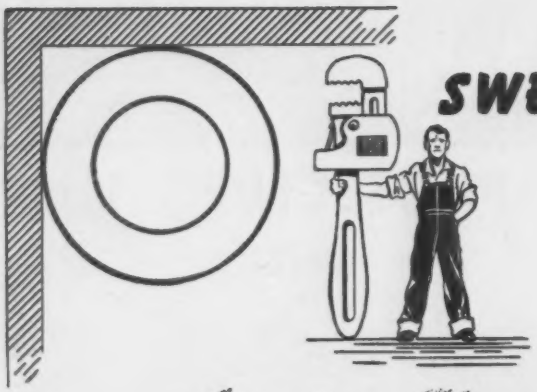
The Kyle Type "H" Automatic Oil Circuit Recloser is a single pole unit designed to protect branch lines from a substation feeder through coordination with fuse links or to protect extended rural lines by coordination with other Type "H" Reclosers.

All Kyle Reclosers provide the maximum safety for both linemen and property. The only live parts are the upper bushing terminals. Recloser handle is trip-free of the operating mechanism and cannot impart a shock to the operator.



MADE BY KYLE CORPORATION SOUTH MILWAUKEE WISCONSIN

KYLE Circuit Reclosers are Designed and Manufactured for LINE MATERIAL COMPANY MILWAUKEE WISCONSIN



SWELL BUSHING... but how do I tighten it in a spot like this?

You don't, Buddy . . . you SWITCH TO an O. Z!

In tight spots, too— O.Z. INSULATED BUSHINGS are O.K.

In tight spots—where there's no room for a wrench—you'll appreciate the *grooved* malleable iron base of O. Z. insulated bushings.

In *any* application where wire, emerging from a conduit, is bent or vibration is encountered, you'll like O. Z. insulated bushings because high-insulating Bakelite is molded and locked to a metal base.

METAL BASE means extra installation economies.

- **No stripped threads:** O. Z. insulated bushings tighten all the way down on the conduit without stripping bushing threads!
- **No inside locknut:** Deep metal base *alone* secures and grounds box to conduit!

CAPPED, TOO . . . to keep inside of conduit clean until cable is pulled.

Local suppliers almost everywhere can give you O. Z. bushings and other O. Z. products *right off the shelf*. Get in touch with your supplier today.

Other types, too—Shown is O. Z. insulated bushing Conduit Type B. . . . O. Z. also makes set screw type insulated bushings, bushings for thin wall conduit, and *grounded* insulated bushings in regular, thin wall, or set screw types.

O.Z. ELECTRICAL MANUFACTURING COMPANY

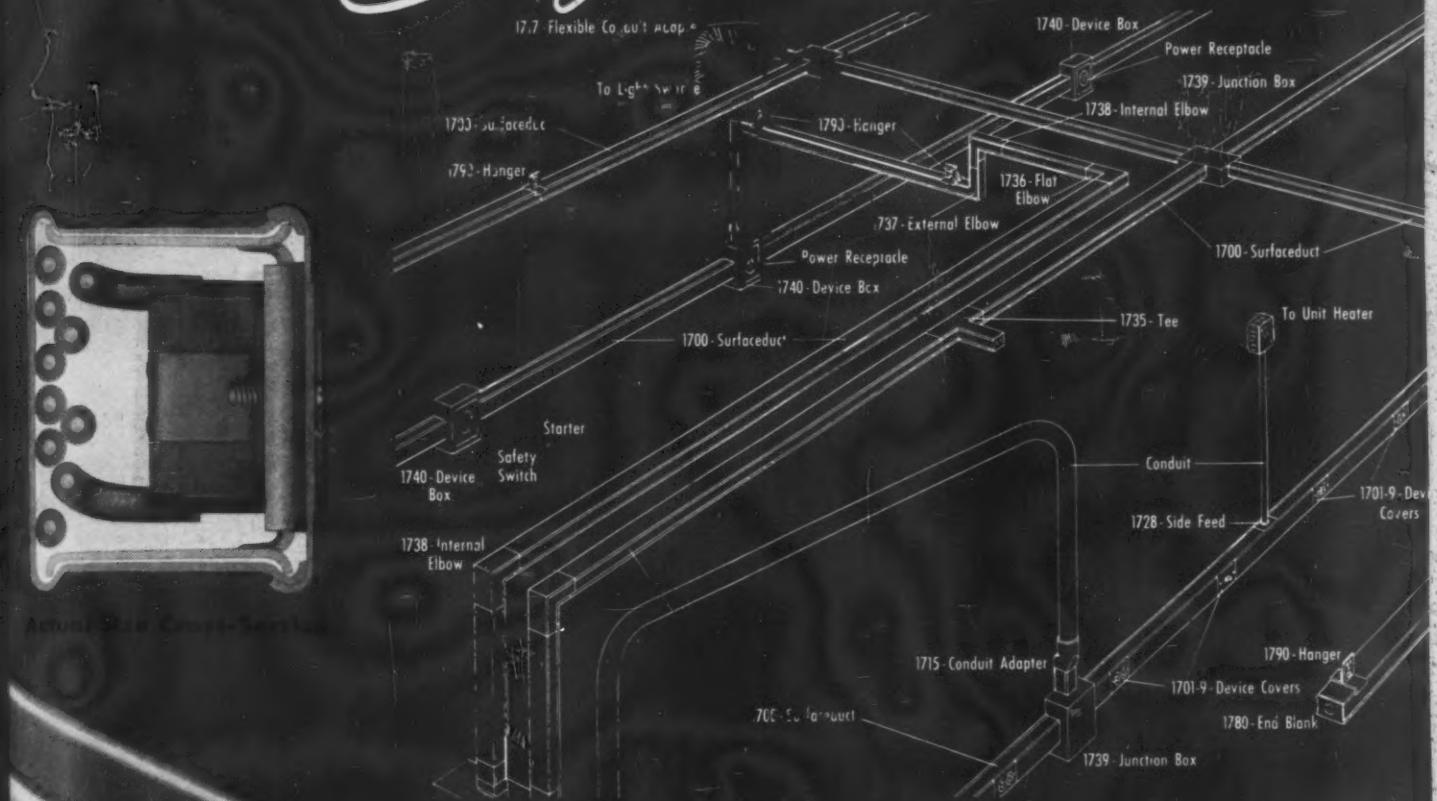
262 BOND STREET · BROOKLYN, 2 N. Y.

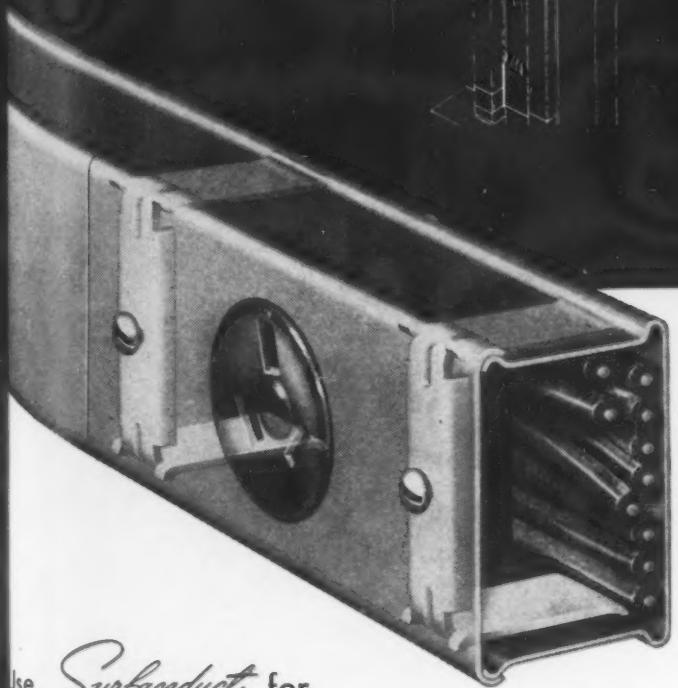
They're OK if they're O. Z.

CONDUIT FITTINGS • CABLE TERMINATORS
CAST IRON BOXES • SOLDERLESS CONNECTORS
GROUNDING DEVICES • POWER CONNECTORS

1765

The New 2x2 *Surfaceduct* will do the job





Use *Surfaceduct* for

- **Feeder and distribution systems.**
- **Commercial and factory lighting.**
- **Assembly lines, laboratories, work-bench tools, etc.**
- **Rewiring existing plants.**

National Electric Surfaceduct is a 2-piece, general purpose, electrical raceway.

No fishing . . . lay in the wires . . . snap on capping. A principle pioneered by National.

Unique bridge provides firm anchorage of capping and devices.

8 device covers accomodate over 300 manufacturers devices.

Designed for loads up to 60 amps.

Gray baked-enamel finish.

12 simple fittings meet all job requirements.

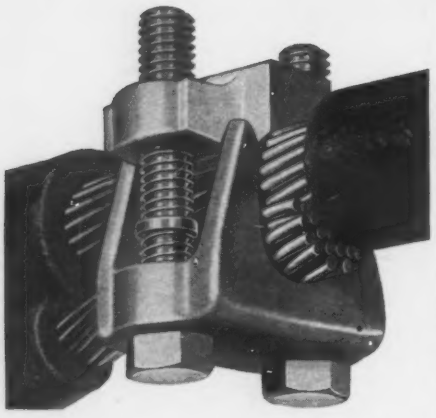
Sold exclusively through electrical wholesalers.

Write for complete catalog information

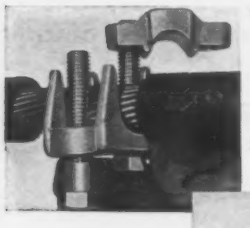
National Electric
PRODUCTS CORPORATION
Box 897 — Pittsburgh 30, Pa.

NATIONAL ELECTRIC PRODUCTS
WIRING SYSTEMS
WIRES AND CABLES

MATTHEWS UNICLAMP CONNECTORS

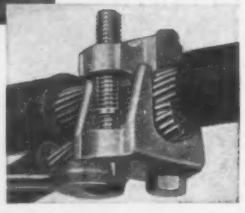


Made for use on copper or aluminum wires from 2/0 to 1000 MCM inclusive. They will connect two wires of their rated size or one wire of their rated size with one or more smaller tap-off wires down to No. 8 solid. They have many advantages over the larger sizes of connectors of the split bolt and other designs as they provide greater pressure between wires, hence greater holding power, are less costly, are easier to install and the assembled design is such that parts cannot become separated.



Fit on conductor as shown. Position top member and partially thread in free bolt.

Insert tap wire and equally draw up both bolts.



Write for Bulletin 206

W. N. MATTHEWS CORP.
3722 FOREST PARK BLVD.
ST. LOUIS 8, MO.

BULLETINS

data books, etc.

Remote Control (1114)

Remote indicating and control systems are explained in a 12-page bulletin from Allis-Chalmers. How the transmitter, receiver and indicator of such systems are constructed, how they work, their advantages and specifications are presented with photos, diagrams and charts.

Wires and Cables (1115)

An illustrated bulletin describing principle types of Okobestos heat and corrosion resistant wires and cables has been issued by the Okonite Co. Power, apparatus and multiconductor control cables, switchboard and appliance wires are described.

Switch Applications (1116)

Of interest to designers of outdoor substations is a Delta-Star publication, "What Switch Shall I Use?" This booklet outlines applications of both vertical and side break high-voltage three-pole disconnecting switches. Six types are covered, with data cost for the various applications.

Controller (1117)

Foxboro's Bulletin 381 describes its Model 40 controller, recently added to the company line. The operating panel feature of "Stabilog" control instruments is shown. Indicating models, as well as single- and multiple-pen recorders are pictured, and five types of control action available in the model are explained.

Submarine Connectors (1118)

A data sheet on its new series of waterproof connectors, Type W, is offered by Cannon Electric Development Co. These connectors were designed for submarine geophysical exploration and, according to the manufacturers, are adaptable for use in swamps, lakes, rivers, docks, with underground cable, or in outdoor applications where moisture conditions require a sealed fitting.

Controls (1119)

Ward Leonard's Bulletin 100,000 covers that company's electric control cables, including a-c and d-c motor starters, speed and voltage regulators, resistors, ring and plate rheostats, switches, magnetic contactors, relays and dimmers.

Connectors (1120)

"Mechanical Principles of Gorilla Grip Electrical Connectors" is a 12-page booklet available from National Electrical Products Corp. and gives design and function data. These connectors are available for sizes 2,000 MCM to No. 2 stranded, inclusive.

Color Conditioning (1121)

"DuPont Color Conditioning for Industry" is a 32-page booklet describing and illustrating the company's research with color to increase production, improve seeing conditions and working environment.

Street Lighting (1122)

A 28-page illustrated booklet contains construction details and catalog information on Line Material Co.'s spherolite street lighting luminaire.

Indoor Transformers (1123)

R. E. Uptegraff Mfg. Co. has published a bulletin on its improved dry type E transformer. This model is for indoor use and is built in capacities up to 5 kva.

Switch Catalog (1124)

Micro Switch has published Catalog 61, describing its complete line. This publication replaces Catalog 60.

Welding Control (1125)

Importance of control in resistance welding is the subject of a new G-E bulletin.

ELECTRICAL WEST, 68 Post St., San Francisco 4, California
Please send me information about following CIRCLED items:

1100	1101	1102	1103	1104	1105	1106	1107
1108	1109	1110	1111	1112	1113	1114	1115
1116	1117	1118	1119	1120	1121	1122	1123
1124	1125						

Name ..... Company* ..... Title* .....

Address .....

* Please include your company's name and your position, as we cannot ask manufacturers to furnish literature unless you do.

SERVING YOU THROUGH SCIENCE

NOW AVAILABLE FOR
PROMPT DELIVERY
A NEW LINE OF

Laytex RU

Reg. U. S. Trade Mark

BUILDING WIRE *WITH* ALUMINUM CONDUCTORS

All Coils Bear the Underwriters' Laboratories Label

UNITED STATES RUBBER COMPANY · US · TRADE MARK ·

U. S. Rubber Company meets the present shortage of critical materials by augmenting its line of RU Laytex copper conductor wires and cables with a line of RU Laytex Aluminum conductor branch circuit wires and cables.

RU Laytex is America's smallest diameter, lightest weight, rubber-covered building wire. Laytex wires have perfectly centered conductors, insulated with 90% unmilled, grainless natural rubber having excellent dielectric strength. Write for further information.

UNITED STATES RUBBER COMPANY

1230 AVENUE OF THE AMERICAS · ROCKEFELLER CENTER · NEW YORK 20, N.Y.

ELECTRA'S HUSBAND

Selling Management

ELECTRA has been so interested in a copy of *The Hucksters* these past few evenings that I have had a little time for some sober reflection. Perhaps it was because the book she has been reading smeared a lot of mud on the ethics and tactics of advertising that my thoughts turned to that subject. At any rate I've been pondering on why the same advertising techniques which have so successfully sold the products and services of business and industry to the public could not be employed to sell the basic principles of business and industry to the people.

To me, and I suppose to a lot of others who wonder if the great American pattern of individual initiative and freedom must be sacrificed to some form of collectivism, it seems inconceivable that the public can believe in and buy the products of industry and at the same time give the system that produces those products a vote of "no confidence." But the public does. On the one hand sales of everything are at record high levels. On the other hand witness the suspicion, strikes, and bickering between management and labor; weigh how easily pressure groups can foster conflict and bad feelings against industry; ponder the popularity of the politician who adroitly attacks and impugns business. If these are not symptoms of a deteriorating public attitude, then there is no problem and the future promises nothing but sweetness and light.

The question that bothers me most is whether that deteriorating public attitude can be changed to a more favorable opinion in time to preclude chaos. And also, whether the entrepreneurs and managers of business and industry will give the same media that sold their products a chance to sell management to the people. I'm one of those simple souls who believes that the selling job can be accomplished and, furthermore, in time.

Examples of the type of argument which will influence the public favorably are increasing. Advertisements are beginning to appear in magazines and newspapers, ads that have no other purpose than to explain simply and lucidly some of the functions and mechanisms of business and industry. It is to be hoped that they are but the initial dribble of a campaign that will grow to a point where its influence must and will be felt.

It is a good sign when the experts show the way. Having faith and demonstrating it, they invite others to be equally vocal. I have in mind the initial advertisements in a series over the name of the N. W. Ayer advertising agency which are appearing in Western newspapers. The first one answers the question, "What is management?" in the following simple terms.

"Management is as old as the hills. There is nothing complicated about it at all. It is a natural function of human society.

"A man and a woman marry, set up housekeeping, and raise a family. Both are managers.

"They manage as they buy a home, educate the children, plant a garden, pick out a car, a refrigerator, a piano. A hundred decisions a day around the house are management decisions.

"Management occurs at all levels in government, charity, education, lodge. It is the plumber with his helper, the elevator starter, the superintendent of schools, the master of the grange.

"But, in America, management probably has had its most scientific application in business.

"Business management, even before World War I, helped build up a volume of production surpassing that of any other nation. In World War II, the results were even more spectacular. America outproduced all other countries combined.

"By 1941, the value of an hour of work in terms of the staple necessities of life, bread and butter, had so been raised that an American could buy from two to eight times as much as a man in Europe. This didn't just happen.

"Neither the men and women in industry nor the money in industry can be effective without good management. Nothing else is so important to the workers' welfare, the investors' welfare or the public welfare."

Primerlike, the second carries on with the answer to the question "What does management do?":

"Management's first job is to produce something the public wants, at a price the public can pay.

"There is no exception to this.

"The playing rules are clear, too. Management must pay good wages to attract good workers.

"It must make a fair profit—to attract investors, and to assure the continued financial integrity of the business.

"It must keep abreast of changing conditions—for only a growing business can provide real security for its employees and offer a better product to the public.

"All this is a large order. It calls for initiative, judgment, a good batting eye.

"The scoreboard, over the years, shows how well management has come through.

"Neither the men and women in industry nor the money in industry can be effective without good management. Nothing else is so important to the workers' welfare, the investors' welfare, or the public welfare."

The public seems to have a short-circuited idea that the goods it buys and uses are automatically produced by applying labor to materials; to be ignorant of the management that seeks out and provides the materials and directs the labor, so that a usable product can result and be distributed.

But management is only one of the functions of business that is suspect. And this advertising agency is but one single voice out of a potential chorus. There are many organizations in the electrical industry that might add their talent and resources to the task of telling the story. Every passing day increases the odds; but then the rewards are great—self-preservation.

IN this day and age can anyone imagine refrigerator competition so keen that dealers would be offering customers a ten per cent discount from list prices? Yet one of our friends who has just returned from the Atlantic seaboard reports that such sales tactics are not unheard of in that region. With no refrigerators to deliver (or practically none) and with the greatest unsatisfied customer demand in the history of the business, the competition for orders, which may or may not prove to be "solid," reaches such a point that dealers are offering discounts! It sounds preposterous. One observer says with considerable feeling that "it could only happen in the electrical business."

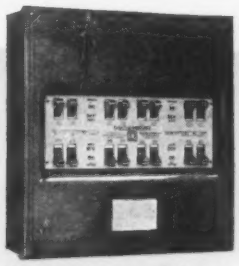
Wherever you need...
OVERCURRENT PROTECTION

You save time and money with Square D Circuit Breakers

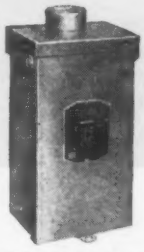
Weatherproof, Dust-Tight and Explosion-Resisting Circuit Breakers.

MO Multi-breaker for use on small machines.

Industrial Circuit Breakers in standard sheet steel enclosures.



Multi-breaker Load Centers for controlling and protecting lighting and small power circuits.



Rain-tight Multi-breakers with a variety of circuit arrangements.

Industrial Multi-breakers in capacities from 15 to 100 amperes, with 2 or 3 poles.

Multi-breaker Load Centers in Cast Iron Enclosures for Class 1, Group D and lower applications.

Multi-breaker Type M Load Centers with 50 ampere frame breakers for applications involving 120-240 volt AC circuits.

HERE'S HOW YOU SAVE TIME...

1 *Harmless momentary overloads pass without breaking the circuit, due to a time-lag feature built into every Square D Circuit Breaker.*

2 *Restoration of service is quick and easy. No replacing of fuses. A simple movement of the operating lever restores current after the cause of the short or overload has been eliminated.*

HERE'S HOW YOU SAVE MONEY...

1 *Fuses are eliminated—no replacement of parts is necessary.*

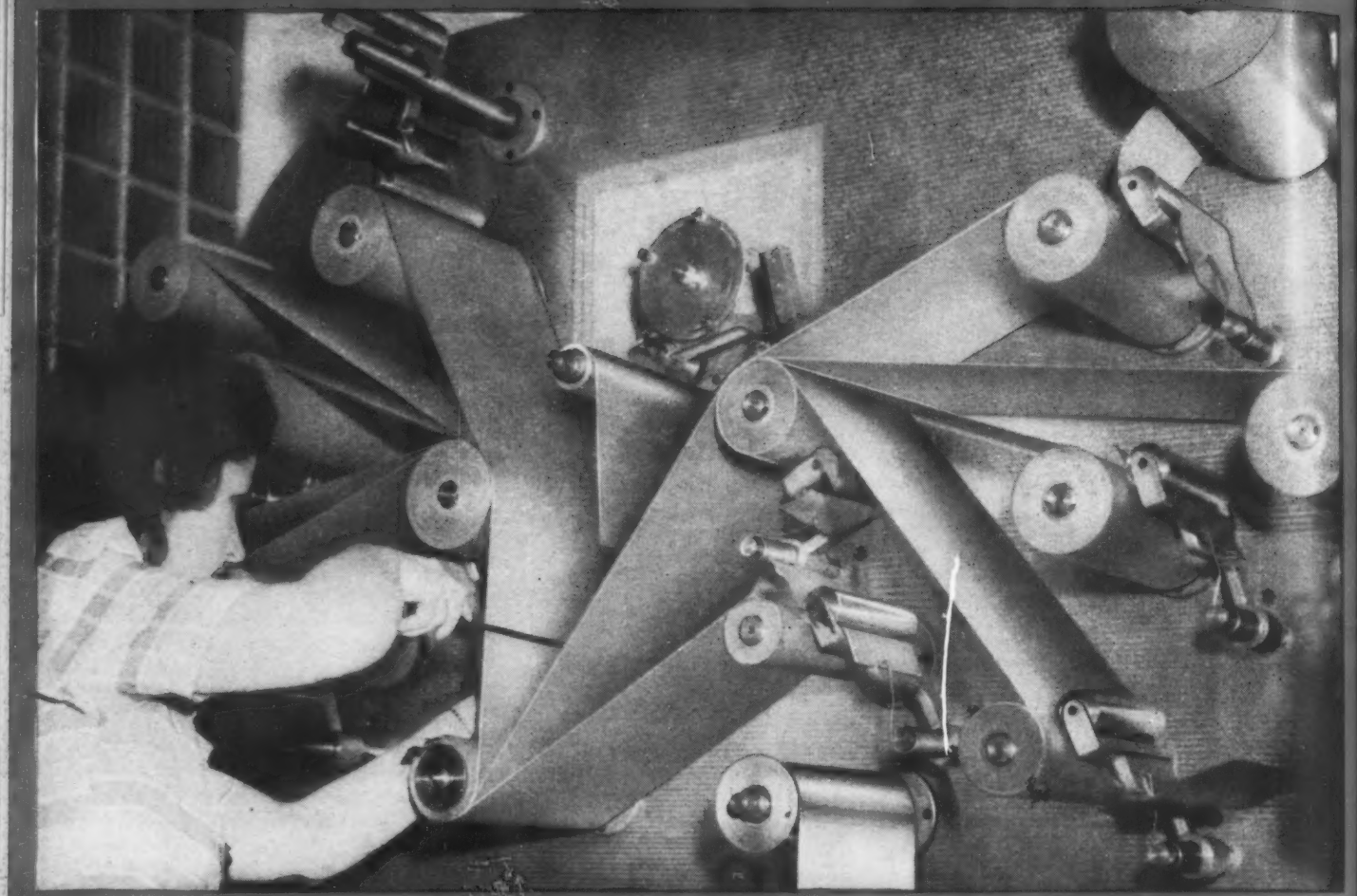
2 *Electrical equipment has constant proper protection, because every Square D Circuit Breaker unit is factory-sealed and consequently tamper-proof.*

Square D makes exactly the Breaker you need

• Square D's *complete* line enables you to select exactly the right device for any given installation. A wide variety of enclosures, including general-purpose, raintight, dust-resisting, and explosion-resisting. Capacities range from 15 to 600 amperes, up to 600 volts. Send for INDUSTRIAL CIRCUIT BREAKER BULLETIN which illustrates and describes the complete line.

SQUARE D COMPANY

DETROIT • MILWAUKEE • LOS ANGELES



How L-M Distribution Capacitors are Built to Yield Utmost Service and Longer Life

The real heart of a capacitor is the "pack", made by winding together thousands of yards of special thin Kraft insulating tissue with pure aluminum foil.

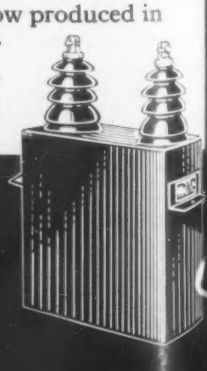
Working in a spotlessly clean room, in air free from dust and closely controlled as to temperature and humidity, this young woman has just finished winding a pack for an L-M Capacitor. Here are three reasons for the exceptional performance and long life of these capacitors:

1 Packs are not overworked. Extra layers of insulating tissue are added between the aluminum foil capacitor plates to reduce the voltage stress—to provide a higher than usual safety factor against breakdown.

2 Insulation is dried and impregnated by L-M's exclusive method, under controlled heat, high vacuum and continuous *individual unit* electrical testing. The slow "capillary impregnation" is begun at the most opportune time and carefully controlled to assure complete saturation and freedom from voids or pockets.

3 "Elemex" is an ideal dielectric liquid developed by L-M chemists. It is extremely stable, with negligible electric losses and high dielectric constant and strength. It is extremely noninflammable and it has no affinity for moisture.

These safety-plus factors add up to the highest type of reliable field performance. L-M Capacitors meet AIEE-NEMA standards for outdoor service. Now produced in sizes 2,400 to 13,800 volts, 15 KVA. For further information address Line Material Company, Milwaukee 1, Wisconsin.



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LINE MATERIAL

CAPACITORS

L-M DISTRIBUTION EQUIPMENT INCLUDES: Distribution Transformers • Fuse Cutouts and Fuse Links • Lightning Arresters • Oil Switches • Pole Line Hardware • Line Construction Specialties • Underground Equipment • Fibre Conduit • Street and Airport Lighting Equipment • Wired Radio Control Equipment • Capacitors

ELECTRICAL WEST

NOVEMBER, 1946
VOL. 97 NO. 5

PROSPECTUS ON ATOMIC POWER

Carefully studying the available facts, an eminent group of California scientists present a summary which suggests early arrival of electric power generating plants deriving their energy from nuclear fission. Closely evaluating costs, and viewing the problem from geological, theoretical, engineering and industrial aspects, they show that insuperable obstacles, if any, must lie in other domains

ONCE in the unrecorded history of man there existed a fearsome scourge. It swept out of the mountains with the speed of the wind and a trembling of the earth; it sprang from the heavens with a thundering roar; it laid waste vast plains and thick forests with equal facility. Man's carefully hoarded winter stores, his spare clothing and tools were all periodically destroyed, his game dispersed, and his family and tribe frequently lost in the flight. This enemy of early humanity was fire.

By the use of native intelligence this scourge was changed to a boon. By means of fire man survived the era of encroaching ice packs. He went on to discover that fire could be constructively utilized. Fire has become man's primary source of power. Fire still destroys man's property on a stupendous scale, but without it, few men could now survive.

We have enough understanding of history to venture the prediction that, in general, atomic energy will follow the same pattern. The time scale, however, will be condensed. This time we need not grope for applications. Power is now a commodity in very active demand. The release of atomic energy gives us a power source of virtually unlimited extent, to tap the source we need only to expend a certain amount of effort. *How does this effort compare with that used for our present sources which stem from combustion, falling water, or the sun?* The answer is already apparent. Right now, atomic energy is costly, but as techniques for handling it develop, the expense should decrease rapidly to the point where large installations become economic. Quoting from a report of a large group of scientists advising the Secretary of War's Interim Committee on Atomic Energy:

"We have examined in some detail the technical problems of making available heat and power on the scale of present world consumption from controlled nuclear reacters. We see no significant limitations on this development, either in the availability or in the cost of the fundamental active materials. We see characteristic limitations and characteristic advantages in atomic power which make us regard it in great measure as a supplement to existing sources, and an incentive to new developments, rather than as a competitor, let us say, to coal or to petroleum products. We see no foundation in current science for the hope that atomic power can be effectively used for light, small portable units such as are required for aircraft and automotive transportation; but we believe that the development of rather large power units for heat and conversion to electrical energy is a program for the near future; that operating units which serve to demonstrate the usefulness and limitations of atomic power can be in existence within a few years, and that only the gradual incorporation and adaption of such units to the specific demands of contemporary economy will involve a protracted development."

For an industrial scientist the problem of harnessing atomic energy can be stated as follows: *It is desired to transform random high-energy atomic and molecular motion into a form that is readily transported and utilized with as great an efficiency as possible.* This differs from the thermal systems to which heat engines are now applied only in the magnitude of energies involved. The new energies may be of a million-fold greater intensity.

As to transporting and utilizing the energy once it is got into workable form, electricity appears to be the answer. It is generally accepted that in the future relatively all stationary power demands, and a fair share of the mobile as well, will be filled by electric power. Even the energy needed for heating homes and offices may eventually be so derived—a possi-

THE AUTHORS

This study was prepared as a project of the Carnegie Endowment Committee on Atomic Energy. At the University of California, where this organization is represented by Prof. J. B. Condliffe, an informal committee was formed in cooperation with the Northern California Assn. of Scientists to consider the social impact of atomic energy. This committee proceeded to collect, check and analyze available information. It is from material so processed at the first four meetings of the committee that the accompanying paper was prepared. The work does not presume to be authoritative in the sense of stemming directly from physical research. Rather, it is an analysis of available information, assembled in such a form that it may be used by research workers and administrators in the more non-technical fields Many scientists have contributed to the paper's preparation.

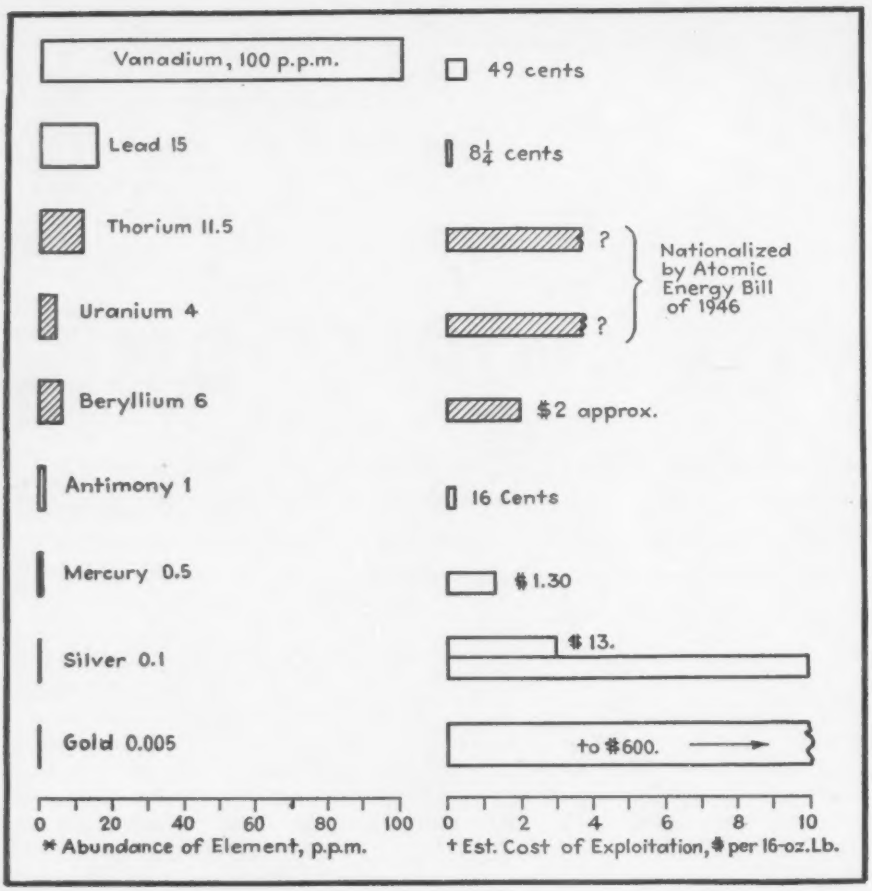


Fig. 1—Abundance and estimated costs of certain elements compared to uranium and thorium. Figures by Goldschmidt, 'J. Chem. Soc.,' 655-73 (1937)

bility which is enhanced by the potentialities of the electrically driven heat pump.

In view of all these factors, we shall concentrate our consideration of atomic power developments on those aspects which concern the conversion of atomic into electrical energy.

The Geological Approach

URANIUM is not a rare element. Its abundance in the earth's crust is greater than that of silver, antimony, and mercury combined, metals which have been extensively mined and are now key components in our industry. Thorium is still more abundant than uranium.

This relative abundance is not, however, closely related to availability. Most uranium is locked up in igneous rocks, among which it is sometimes found concentrated to a minor degree in pegmatites (coarse granites occurring in dikes and veins). Unlike many of the elements, uranium was not concentrated into rich ore bodies. Few of the known primary deposits contain uranium in sufficient concentration to permit commercial exploitation. The richer and more useful deposits have been formed through erosion of large volumes of igneous rocks and subsequent concentration by surface waters. These concentrations by natural means must be more than 1,000-fold before 5 lb. to 20 lb. of uranium can be obtained per ton of ore; this appears to be the lowest range of concentrations that can now be economically worked. To make things more difficult, much of the uranium is intimately combined with other elements which are chemically and crystallo-graphically similar (vanadium, etc.), a situation which adds to the effort needed to extract uranium from the ores. The value derived from vanadium and the other by-product metals usually constitutes no more than partial compensation for the extra effort involved.

The known workable deposits of uranium are scarce — principally because the ores had no value until 1940 and were therefore not sought by prospectors. Recently there has been a flurry of reports relating to the discovery of new deposits in all parts of the world. Existing knowledge of the origin of uranium deposits (which is believed to be quite complete) indicates, however, that new discoveries can be expected to diminish in size and number. Thus a generation or so hence we shall be facing the problems of developing medium to low grade ores.

The more acidic light-colored igneous rocks, such as the granites and the rhyolites, have been shown to contain 10-20 grams of fissionable elements per ton (20-25% of which is uranium, the remainder thorium) while the more basic and generally older and darker igneous rocks such as basalt usually have only 3-8 grams per ton. This means that the world has now a huge reserve of fuel for power production. If 10 grams of the fissionable materials in a ton of granite were extracted and "reacted" the resultant power would be equivalent to more than 40 tons of coal (see Table I). Since granite is one of the most common rocks on the face of the earth the supply of "low grade ore" seems to be practically limitless.

At present it is estimated that the mining costs for uranium should be in the neighborhood of $2-5 per pound of metal in order to be competitive with other energy sources. Since utilization in a pile requires scrupulous purity it is probable that the costs of additional refining may raise the total expense as charged to the power producing plant to around $5-10 per pound. These costs are based on the exploitation of presently known ore bodies, which in general are very limited in extent, so that the costs of fissionable materials are likely to go up gradually in the future. Allowing expenses of several dollars per gram, it should not be difficult to work out methods for extracting fissionable material from granites or other low-grade, large-volume sources. As will be seen later, a cost of several dollars per gram would barely affect the cost of power if one takes into account the fact that practically all the fissionable materials introduced into a power pile probably could eventually be transformed into energy.

The sensible way to go about the utilization of uranium resources would be to set up a coordinated world-wide geological survey. This agency would plot out the most favorable areas for prospecting and investigate them in the order of their promise. Such procedure would postpone the necessity for developing low grade ores to a time perhaps 20 to 50 years hence. This should be a sufficient period in which to develop new ore-concentrating and refining techniques. One of the principal difficulties of large mines treating low grade ores is power supply, many such ore deposits being in remote areas. This difficulty might

itself be overcome by means of atomic power plants.

It can be concluded then that the new resources of energy-yielding mineral deposits are sufficient to carry the human race through many centuries. No major difficulties are expected in the conversion of ore to refined metal.

The Theoretical Approach

FUNDAMENTALLY the problem of obtaining useful energy from fission reactions does not differ greatly from that of producing bombs. The reactions of neutrons and other subatomic particles are very much the same in both instances. The basic processes going on in a water-cooled pile, as at Hanford, are not greatly different from those that would go on at 1,500°F when using some other heat exchange fluid, and the same may be said for the chemistry of the separation.

The description which the research scientists have of the fission process for uranium and plutonium is quantitative and relatively precise. Briefly, it is stated that a neutron, preferably slow, combines with a U235 or Pu239 nucleus according to a known probability. This combination is followed almost simultaneously by a violent fission whereby two positively charged nuclei (whose composition is fairly accurately known) fly in opposite directions at tremendous speeds; at the same time, according to the Smyth Report, between one and three neutrons are also released at high velocities. According to early sources the average number of neutrons released is in the neighborhood of 2.3 and 3.1 per fission. Collisions of the high-speed fission fragments with nearby atoms rapidly brings them to halt, and in the process the surrounding region acquires this energy in the form of heat. It is this heat which, when conducted out of the pile and transferred to a turbine by means of an expanded gas, is directly responsible for the power derived.

Almost everything that physicists know about atomic nuclei is confined to their behavior at energies less than 100 million electron volts (Mev.). The highest range of energies is so far attainable only in the largest cyclotrons and other nuclear apparati and in fission itself. So far, the reactions to be observed from the collision of particles with nuclei at still higher energies can be found only in the study of cosmic rays. Because of such remoteness and lack of control, man's fundamental understanding of highly energetic matter has come slowly. With the new nuclear apparatus now possible, some of which is already being built, 200-500 Mev. can be obtained. Thus it is possible to explore some new regions with results that are quite unpredictable, even with regard to atomic power developments.

The theoretical approach to power production then is an indirect one. The primary problem now for the mathematically inclined is one of developing a general theory for the behavior of atomic nuclei so that experimental data concerning fission, radio-activity, neutron capture, and other nuclear phenomena all fall within the framework of the theory. When such a theory is established (and published) it will be possible to carry out significant experiments with ease and a minimum of wasted effort. Such general

Table I.—Power Station Cost Analysis

Assumptions:

1. A plant factor of 50 (4380 kwh. per year per kw. installed capacity).
2. A utilization factor of 90 (peak load is 90% of rated capacity).
3. Costs are representative for present designs in the United States.
4. Designs of atomic-pile units essentially as described, **a preliminary estimate.**

Plant Comparisons	Coal	Coal	Primary Pile	Plutonium Reactor	Plutonium Reactor
Capacity (kw.)	20,000	100,000	500,000	20,000	100,000
Area (acres)	2.0	10.0	(10,000)	2.0	2.0
Boiler room (cu. ft.)	400,000	1,500,000	2,000,000	200,000	600,000
Turbine room (cu. ft.)	200,000	900,000	3,500,000	200,000	900,000
Switch house (cu. ft.)	50,000	500,000	2,000,000	50,000	500,000
Thermal efficiency	25%	35%	40%	30%	40%
Employees	25	60	200	20	40
Capital Cost					
Land and improvements	$ 60,000	$ 600,000	$(2,000,000)	$ 60,000	$ 100,000
Buildings (exclusive of piles)	1,000,000	3,000,000	8,500,000	700,000	2,000,000
Pile units and accessories	.....	.....	(24,000,000)	(1,100,000)	(2,000,000)
Fuel handling and storage	.....	2,000,000	200,000	.....	100,000
Condensing Supply	.....	250,000	1,500,000	.....	250,000
Waste handling	.....	100,000	1,000,000	.....	100,000
Boiler plant	1,000,000	1,500,000	7,500,000	600,000	1,000,000
Draft system	.....	200,000	.....	.....	.....
Feedwater system	.....	400,000	2,000,000	.....	400,000
Piping system	.....	500,000	2,500,000	.....	500,000
Heat recovery apparatus	.....	250,000	1,000,000	.....	250,000
Turbogenerators and auxiliary equipment	670,000	2,400,000	10,000,000	670,000	2,400,000
Switchgear and wiring	250,000	1,200,000	6,000,000	250,000	1,200,000
Switching yard and equipment	300,000	800,000	2,500,000	300,000	800,000
Total	**$3,280,000**	**$13,200,000**	**$68,700,000**	**$3,680,000**	**$11,100,000**
Fuel (coal—$6T, U—$10lb., Pu—$20g)	$ 360,000	$1,000,000	100,000	270,000	1,000,000
Wages and salaries (at $4,000)	100,000	240,000	800,000	80,000	160,000
Maintenance and supplies	30,000	120,000	1,000,000	40,000	150,000
Fixed charges (15%)	490,000	1,980,000	10,300,000	570,000	1,660,000
Total cost per year	**$ 980,000**	**$3,340,000**	**$12,200,000**	**$ 960,000**	**$2,970,000**
Cost per kw.	**11 mills**	**7½ mills**	.....	.....	.....

Steam data from "Electrical World," Dec. 2, 1939.

theories are the lifeblood of applied scientific research and development. Intensive research upon industrial applications is expensive and therefore can hardly be carried out unless there is a good chance for success. Once there exists an acceptable general theory then the large-scale uses can be visualized, the economic prospects analyzed, and the workers and funds obtained. Without such basic theory, research on applications becomes a gamble against great odds, and intensive efforts are usually unrewarding. The new processes and industries created are then limited in number and slow in development.

We should not ignore the possibility that some new series of nuclear reactions may be discovered leading to new means of power development. This might result from the search for the general theory. On the other hand, experimental techniques involving the use of such varied instruments as the cyclotron, betatron, synchroton, and the linear accelerator, are becoming so advanced that the discovery of new nuclear reactions which would, in turn, aid in the development of the theory is quite possible.

It is recognized that the first economic production of power from atomic energy may be as much as five to ten years distant. This is a sufficient amount of time to develop and test such a general theory if it is going to be at all tractable. (Some theories in science have proven to be very difficult to develop. The general field theory, for instance, has been attacked by many workers, including Albert Einstein, for several decades without much success.) The hazard of a new, highly efficient process being discovered which would render obsolete all existing plants is a very real one as long as no general theory exists; once the theory has been developed and worked with for some years the chance of a complete revolution decreases substantially.

At present, only uranium and plutonium piles can operate continuously in the production of power. Perhaps thorium, by a roundabout process, might be used as a primary fuel in conjunction with uranium and plutonium. Basic data on thorium research have not, however, been released. It has been shown recently that three to four times as much thorium exists in the earth's crust as uranium and that as a fuel it is likely to remain cheap for a longer period of time. It is difficult to say whether any fundamental data on the use of thorium needs to be obtained, but if such a situation exists it would certainly deserve the highest priority.

In summary, then, an analysis of the theoretical approach to power production leads to the following conclusions:

1. All possible encouragement must be given to the development of a fundamental theory of atomic nuclei;
2. The possibility of wasting capital, through obsolescence resulting from advances in nuclear physics, is reduced once a nuclear theory exists.
3. Because thorium is relatively abundant, the way should be cleared toward its utilization in power piles. This may require only the release of information.

The Engineer's Approach

THE fundamental problem of an engineer in atomic energy development is to put a theoretically sound and thoroughly tested process on an operable and economic basis. This will require new materials and novel techniques of fabrication. The materials and techniques used in present piles certainly work, but in most cases they cost too much, and in many cases they are inefficient. The improvement of design and construction is a lengthy and arduous task, one that should be embarked upon as soon as possible with a highly coordinated staff.

The War Department is carrying out a part of this work. The sum of $2,500,000 has been authorized for the design and construction of the Daniels Pile which is to be the world's first high-temperature uranium pile. This project is reported to be primarily a means of testing out certain ideas of general pile behavior at high temperature and is not necessarily intended to be any pilot plant for future producing units. Engineers at Oak Ridge believe that the Daniels Pile will be in operation some time in the spring of 1947 and produce some power by 1948.

For the purposes of simplicity, the secondary power pile will be considered in detail, and the characteristics of the primary pile treated only if they differ in any respect other than magnitude. The distinction between the two types was first made by the Board of Consultants to the Secretary of State's Committee on Atomic Energy in *A Report on the International Control of Atomic Energy*. This group which was composed primarily of administrative scientists and engineers, carefully separated the "safe" from the "unsafe" activities. By "safe" they meant that the materials and methods used could not be turned to military advantage, except by the construction of relatively large-scale facilities which could be easily detected by an uncomplicated scheme for inspection, allowing perhaps a one to three year warning preliminary to the outbreak of hostilities involving atomic-bomb warfare. In any plant deemed "unsafe," however, it would be possible to produce plutonium suitable for explosives within very short notice, or secretly perhaps by withholding part of the production.

A high-energy plutonium reactor using denatured material was considered to be a "safe" activity, one which could be allowed to the various states and industrial concerns with only routine supervision and inspection. This reduces the political considerations in the location and operation of the secondary pile so that economic considerations may be emphasized. Before any installations are likely to be made they must at least give promise of producing either power or industrial tracers, or both, more cheaply than they can be produced by other means.

For this purpose design engineers (by necessity not connected with the Manhattan District) have taken all the available published information and tried to estimate very roughly the cost of installing these high-energy reactors as the thermal units in power plants of specified sizes. The large size (100,000 kw.) would provide sufficient power for a highly industrialized area including several hundred thousand people whereas the small size (20,000 kw.) is sufficient for isolated operations such as mines, air bases, and newly developed agricultural areas.

The large size was envisaged to consist first of a thick shell of concrete and special insulating materials perhaps 30-50 ft. in diameter, sunk in the ground. Then, on the inside of this shell, would be found a "tamper" or "reflector" which may be made of beryllium or some other material which does not lead to the loss of neutrons but causes a rapid reduction in their velocity. Next to the "reflector" might be found a layer of chemicals so chosen that they would react with the stray neutrons from the reaction and form such radio-tracers as may be desired. In the interior, the pile itself, would be: a mass of plutonium, which is suitably protected from the heat it is expected to evolve, highly purified moderator, which is intended to reduce the velocity of the neutrons produced by fission, and a heat exchange medium consisting of liquified metal. Preliminary calculations seem to indicate that the means employed in transferring the heat from the plutonium to the steam which

would actuate a turbine will determine the over-all dimensions of the interior. The design engineer at present appears to have two alternatives, (1) to pump huge quantities of hot molten metal, or (2) to vaporize and condense a suitable metallic liquid. Both systems seem to have their difficulties, but scientists who have complete access to the present knowledge of pile operation are confident that these difficulties can be resolved in a few years. In addition, machinery must be installed for loading and unloading of the plutoninum and perhaps also for the occasional replacement of other parts of the pile.

Besides the reactor, a considerable amount of accessory equipment must be present. A small chemical plant, operated by remote control, must dissolve the "burned out" slugs of plutonium and separate it by chemical means from the fission products. The unreacted plutonium can then be returned to the pile. The useful fission products would be separated there and the remainder disposed of. Waste disposal was conceived as consisting of deep wells similar to natural gas wells driven to a stratum where a suitable reservoir could be eroded out, it could also be a pipeline to the bottom of the ocean, or some other strategem of equivalent cost. Other plant facilities would probably be necessary to further process and put into distributable form the tracers that would be obtained, but it is assumed that all such installations would be paid for by the sales of tracers, and would not be involved in the economics of power production.

The turbine then would be operated by steam, or perhaps by air, which was heated by being passed over coils containing the heat exchange fluid brought from the pile. In this manner it is hoped to minimize the problem of getting highly radio-active material inside the turbine which would tend to preclude any sort of repair and maintenance work. The turbine should be operated at more than 1,000°F if highest efficiency is to be obtained. It is interesting to note that a turbine operated with plutonium fuel in such a manner as described would have a considerable advantage in thermal efficiency, that is, the ability to transform thermal energy into electrical energy. Since no large volumes of gases are formed as a result of "combustion" in a pile, and losses due to radiation and convection are infinitesimal, it is obvious that practically no heat goes out of the chimney. Therefore an efficient plant should easily transform 40% of the calories evolved into kilowatt-hours.

The generators, transformers, etc., need be no different when using atomic energy. The costs allowed for these items as well as the turbines are the same as those indicated for contemporary construction.

Primary Pile

The design of a primary pile is more involved than that which was just reviewed for the high-energy plutonium reactor. In present-day designs, the fuel of a primary pile would probably be an alloy of uranium and plutonium. Its principal process would involve the fission of U-235 and plutonium, carried out in such a manner that the neutrons produced would create even more fissionable material than was destroyed. As a net result, both plutonium and power are obtained, with pure uranium as the only raw material required.

Primary-pile units must be relatively large in order to be efficient. This is made necessary by the operating and chemical processing equipment, as well as by the facilities for the disposal of wastes. The construction of a series of small plants instead of one big one would involve a multiplication of the most expensive facilities and therefore does not appear reasonable. These primary-pile units would be expected to generate many hundreds of thousands of kilowatts of power when fully operated. At present it is estimated from the available data that for every 8,000 kwh. produced from the primary pile at 40% thermal efficiency one gram of plutonium could be separated. Because of the emphasis on plutonium production, the number of stray neutrons available for the production of by-product tracers in the primary pile would be at a minimum. Therefore, in the accounting analysis which follows, the value of tracers from primary piles has been neglected.

It is readily seen that the primary pile is a huge enterprise. It is also clear that if the problems of efficiently transforming the heat evolved from fission into electrical energy are solved

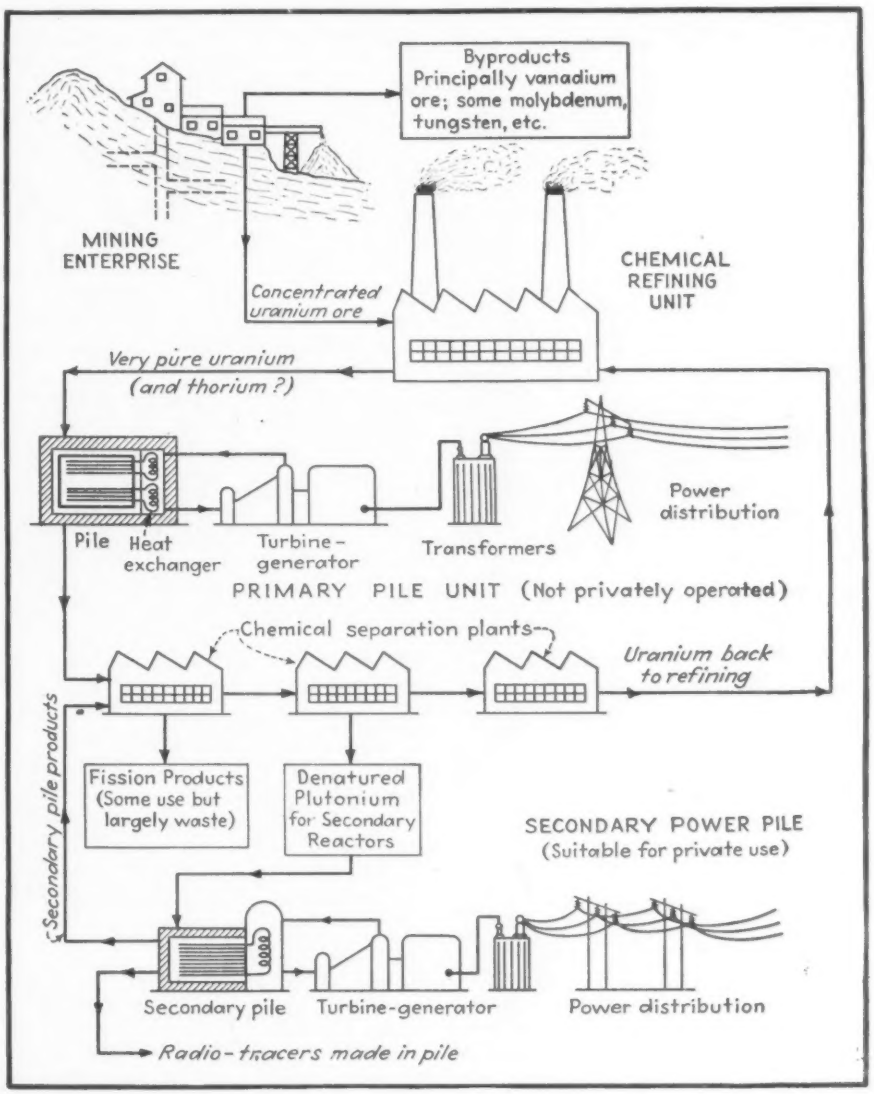


Fig. 2—The atomic energy industry in 195X as envisioned in control plan offered the United Nations by U. S.

for the primary pile, the same problems are solved for every plutonium reactor. In fact, practically every unit involved in the high-energy plutonium reactor is a special case of some larger, more complicated unit in the primary pile.

It can be concluded that the most efficient approach to the engineering problems of atomic power is to organize a concerted effort toward developing the new materials, techniques and components required for the primary piles.

The Industrial Approach

GIVEN a scheme for the production of power such as has been described in the preceding pages, one can determine on what bases and under what conditions it is economic to construct an atomic power plant in the United States. The preciseness with which this can be determined is, however, limited by the extent of published information. In the case of the primary pile—producing fission matter, power and plutonium—quantities of each product cannot be stated. About all that can be done is to circumscribe these quantities within theoretical limits. Each item with regard to the primary pile will be taken up in turn and discussed from the point of view of ascertaining at least the order of magnitude involved.

Fission Products

Fission products are formed in direct proportion to the energy evolved, about one gram of assorted radioactive elements becoming available for every 8,000 kwh. of electricity (at 40% thermal efficiency). To keep the plant operating effectively, these fission products must be carefully separated from the uranium and plutonium in chemical plants operated by remote control. The identity of the principal long-lived components of the fission products has been recently revealed and they are slowly being made available to research laboratories. (*Science* 103, 700 [1946]). At present only the elements with half-lives greater than a week or more can be considered as useful and marketable tracers.

In this classification of "useful tracers from fission products" are isotopes of the following elements: zirconium, columbium, yttrium, cerium, barium, strontium, praseodymium, neodymium, europium, cesium, ruthenium, tellurium, and iodine. Only two of these, barium and iodine, have any widespread industrial or medical use.

It is worthwhile to estimate the maximum demand visualized for such a representative radio-tracer as I-131, which has a half-life of 8.0 days. It is used in medicine in dosages of the order of millicuries; this means that several million people can be treated with a single milligram of radioactive iodine. If we should wish to go further than that and "tag" all of the commercial iodine in the world, a simple calculation using 10,000 disintegrations per gram of iodine per second shows that we should require less than a milligram per year. Contrast this estimate of maximum demand with the several milligrams daily that could be produced by even the smallest power pile. Since radio-iodine is one of the most favorable examples that could be chosen among the useful tracers from fission products, it must be concluded that there is no immediate market for fission products which would affect the economics of power plants, although special uses of an as yet unpredictable nature should not be ruled out.

On the other hand, the highly radioactive elements formed in the fission process constitute such a difficult disposal problem that they actually are a cost. Disposal must be such that neither operating personnel nor neighboring population are exposed to even a millionth part at any time. Food, air, and drinking water can become contaminated as a result of improper design or by odd concentration effects such as are occasionally found in nature.

So far only a few practical solutions to this problem have been suggested. Uranium-plutonium alloys can be dissolved in acid, releasing the deadly fission products in solid, liquid, or gaseous form. A separation plant might be situated on an island or peninsula where it could pump the radio-active gases and solutions to the bottom of the ocean, allowing them to diffuse into at least a cubic mile of sea water. A separation plant situated in plains or low hills might be equipped with the equivalent of oil wells reaching to some point below an impervious stratum from which the waste would not be likely to diffuse into drinking water. A plant operated in rocky, mountainous country would probably be most expensive—fission products might have to be sealed in some shaft in the rocks. Thus it is seen that where waste must be stored, processes yielding minimum waste volumes will be at a considerable advantage.

The location of many atomic power plants is likely to be determined in large measure by the disposal problem. Desert or oceanside sites appear to have distinct advantages. But in countries like Denmark and Great Britain, where areas of high population density are surrounded by shallow seas and important fishing banks, even such sites may be hard to find.

It has been suggested that escaping neutrons which would ordinarily be absorbed in the shield surrounding the pile could be used in large part in nuclear reactions leading to the synthesis of radio-active "tracer" isotopes. There is a long list of such isotopes that could be so produced, many of which are likely to find considerable application. For that reason a jacket was installed in the suggested design of the power pile which was to contain reagents adapted to capture the stray neutrons and thus be transformed into radio-tracers.

The promising isotopes that could be synthesized are H-3, C-14, P-32, S-35, Cl-36, Ca-45, Ti-51, Cr-51, Fe-55, Co-60, Ni-59, Zn-65, As-76, Br-82, Mo-99, Ag-108, 110, Sn-113, W-185, Hg-203, 205. In each case the half-life is greater than a day and the element involved is important in industrial practice as well as in research. In fact tracers can be applied to practically all large-scale industrial-chemical operations except those involving only nitrogen, oxygen, magnesium, aluminum, and silicon, or any combination of these.

It is, of course, very important to know whether any of these tracer isotopes could be sold in large quantities at prices that would contribute materially to the income of the secondary pile. It is already obvious from previous arguments that medical and experimental uses will account for only a minute fraction of the amounts potentially available. A glance at industrial applications indicates that considerable savings in time, effort, and expense are likely to be discovered in applying tracers to separations and purifications of chemicals, a field that can be expected to expand very rapidly in the near future, and inspection of half-life data and production statistics reveals that C-14 is likely to be a tracer isotope in very great demand. Millions of tons of relatively pure organic chemicals are produced in the United States alone every year, and hundreds of millions of tons of carboniferous materials such as petroleum and coal tar are also processed. Allowing 2,000 disintegrations per minute per gram, at least a milligram of C-14 is needed to "tag" a ton of organic materials. Thus there is a potential demand for several thousand grams of C-14 yearly if the price is reasonable enough.

Fine chemical producers would be quite willing to spend several cents per pound of product to be able to improve process control and purifica-

tion with tracers, but their total demand could amount to only a few grams annually. Producers of bulk organics could afford to pay only a few tenths of a cent per pound of product, and petroleum refiners even less. In order to get a mass market for radio-active carbon, the cost of tagging should average $1 per ton of product. On such a basis it is possible to assign a value of about $1,000 per gram for C-14 as introduced to the industrial process. Allowing for the expense of incorporating C-14 in the model compounds required for tagging reduces its feasible cost at the pile to roughly $500 per gram. The price as set by the Manhattan District based on costs in small reactors in 1946 is about $400,000 per gram.

So far only the eventual demand for C-14 and the sales price needed to induce such demand have been discussed. The supply factors have yet to be investigated. If it can be assumed that 10-25% of the neutrons produced will be utilized, then it is possible to get some idea of the quantities of radio-tracers that can be produced in conjunction with power production. Calculations made on such a basis indicate that a 100,000-kw. power station might produce 100 to 1,000 grams of C-14 per year. On this basis, several such plants would be required to supply the C-14 demand alone. Quite a few more might be needed to meet the demand for other tracers, such as alloy metals. It can be concluded then that in the long term the demand for by-product tracers may easily become large enough to warrant their production in most high-energy plutonium reactors.

Electrical Power

The principal feature of atomic power is that about half of it must come in very large parcels. As was pointed out, primary-pile units involve large-scale chemical separations which must be carried out in equipment operated by remote control. The cost of such plants is not determined so much by the size of the vessels or equipment as by the nature of the control mechanisms required. A pile unit producing 200,000 kw. could not be expected to cost very much less than one producing 1,000,000 kw. The latter quantity is sufficient to supply a highly industrial area of several million people at present levels of energy consumption.

Industrial regions are already equipped with large capacities for power generation, therefore only very large population centers such as New York, Chicago, London, Paris, Leningrad, Moscow, Shanghai, Bombay, Calcutta, etc., could accommodate 200,000 to 1,000,000 kw. all at once. Such industrial regions usually have excellent transportation facilities so that other fuel costs are moderate, and power costs are correspondingly moderate. In the United States, power in such areas seldom costs more than 5 to 6 mills per kwh. to produce, while distribution costs to small consumers are in general much higher.

The nations which might have primary-pile units (an "unsafe" activity) would undoubtedly find it advisable to insist that they be very large units both for political and economic reasons and that they be located at some isolated point near a large industrial area. On those bases the plants would probably be of maximum use in the internal economy.

Plutonium

In a 500,000 kw. primary-pile unit, about 250 kg. (550 lb.) of plutonium can be expected to be produced per year, according to data presently available. This plutonium could be suitably denatured and distributed for use in the independently operated secondary piles at a price of probably $20 to $50 per gram.

Analysis of Cost Factors in Atomic Power Production

A study of the economics of power production from uranium indicates that certain critical data are missing. In order of their importance these are: (1) the cost of the primary-pile unit, (2) the cost of a high-energy plutonium reactor, (3) the value of plutonium, and (4) the value of the electric current produced. The last two are dependent in large part upon the values assigned to the first two, but the functions relating the items are complex and as yet indeterminate unless certain assumptions are made.

Ordinarily the procedure for determining the probable cost of power production is to make estimates of plant costs and fuel requirements, provide for operating and overhead costs, and allow for contingencies and taxes. This can be done very easily for coal-fired installations using cost breakdown data presented in *Electrical World*, Dec. 2, 1939, corrected for subsequent price increases. Since atomic power plants differ principally in the thermal unit employed, a large share of the cost factors apply equally well to them. This breakdown of costs as applied to comparable plants in the U.S. is shown in Table I (page 57).

The sizes of power stations chosen for comparison are quite meaningful. The smallest, 20,000-kw.. represents the minimum for economic use of steam turbines in the United States. For quantities of electricity below this figure it is generally cheaper to employ diesels. The 100,000-kw. size has been shown by prewar data to be well within the capacity range for most efficient power production in coal-fueled plants and therefore represents what are probably the lowest costs attainable in competitive plants designed in 1946. The 500,000-kw. plant size was chosen purely because it seems to be a reasonable compromise between efficiency and practicability.

The cost of the thermal units of atomic power plants along with the requisite accessory facilities is quite unknown because as far as we are told no designs have yet been completed. The only figures inserted have been ones that seemed "reasonable" considering the complexity of the chemical operations involved. Other of the unknown factors, such as value of power, however, are closely determined by competitive systems of power production. Hence the conditions for entry of atomic units into the power production field can be indicated if a price for power equal to that obtained from a typical coal-fueled power station of the same capacity is assumed.

Several conclusions can be drawn immediately from these summations of income.

(1) The most obvious is that the sale of tracers does not contribute greatly to the income derived from the operation of a pile for power purposes. In fact, small units in isolated regions would probably not consider the matter unless C-14 was worth much more than $500 per gram, as was assumed above.

(2) *The excess of income over operating costs (5-15%) indicate that atomic units of what is considered a "reasonable" expense would tend to displace many coal-fueled units.* On such a basis industrial power would *cost* 5-15% less than competitive units using coal at $6 per ton (26 billion B.t.u.) as against plutonium at $20 per gram.

(3) There will always be difficulty in apportioning costs to plutonium and power, the two principal products of a primary pile. According to the American proposal, such plants would be operated by an Atomic Development Authority whereby the authority would wholesale the power to nearby communities and would auction off or otherwise distribute the plutonium to smaller reactors operated independently. How much of the cost of production shall be assigned to electric current? The figure of 4 mills taken here represents a compromise between present urban industrial power costs and those obtained in the most efficient hydroelectric projects. This allowance yields plutonium at a cost per B.t.u. somewhat less than that of coal

Table II.—Earned Income

Plant Comparisons	Primary Pile Unit	Pu Unit	Pu Unit
Capacity	500,000 kw.	20,000 kw.	100,000 kw.
Annual power production	2,190,000,000 kwh.	87,600,000 kwh.	438,000,000 kwh.
Operating costs (estimated)	$12,200,000	$960,000	$2,970,000
Value of power/kwh.	4 mills	11 mills	7½ mills
Income			
Sale of power	$ 8,800,000	$ 965,000	$3,290,000
Sale of plutonium (250 kg.)	5,000,000	.....	.....
Sale of tracers	.....	50,000	250,000
	$13,800,000	$1,015,000	$3,540,000
Income above estimated costs	$ 1,600,000	$ 55,000	$ 570,000

Table III.—Plutonium Value in Marginal Reactors

20,000-kw. Plutonium Reactor		100,000-kw. Plutonium Reactor	
Cost of Atomic Unit	Pu Value	Cost of Atomic Unit	Pu Value
$ 800,000	$27	$ 1,000,000	$34
1,100,000	24	2,000,000	31
1,500,000	20	4,000,000	25
2,000,000	14	6,000,000	19
2,500,000	8	9,000,000	8

Table IV.
Plutonium and Coal as Competitive Fuels for Power Generation

20,000-kw. Station ($1,100,000 Atomic Unit)		100,000-kw. Station ($2,000,000 Atomic Unit)	
Coal Price	Pu Value	Coal Price	Pu Value
$ 3.00	$ 11	$ 3.00	$ 21
4.00	15	4.00	25
5.00	20	5.00	28
6.00	24	6.00	31
8.00	33	8.00	38
10.00	42	10.00	44
12.00	51	12.00	51

as an article of international commerce.

Actually, in a situation where both coal and plutonium are competing, the deciding factor will be the cost of the atomic unit which replaces fuel-storage facilities and furnaces. Taking data as scheduled in Table I, it is possible to estimate the value of plutonium as a fuel as a function of the cost of the atomic unit (Table III).

Table III shows that the "breakeven" point for the cost of a 20,000-kw. atomic unit is about $1,500,000, while for a 100,000-kw. unit the "breakeven" point is approximately $6,000,000. Since the true ratio of costs of the respective units is less than two, based on the judgment of engineers, it seems likely that *in regions of more or less constant fuel costs (seaboard areas and along rail trunk lines) it is likely that the use of plutonium will lead to the use of fewer but larger power installations.* The most economic size of station for power production is expected to jump from an average of 80,000 kw. in 1939 to something like 150,000 to 200,000 kw. by 1960, if atomic energy is in use at that time.

The tendency of the larger-size units to be more efficient is borne out by a comparison of the competitive values of coal and plutonium. Again using data presented in Table I, we tabulate the competitive values in Table IV.

Tables III and IV should be very useful in making surveys of the applicability of atomic power to particular localities in North America and Western Europe, where the prices of coal and other fuel are known, and where adjustments in plant costs can be estimated. When considering less developed areas where interest rates are much higher, all the tables must be reworked before the real impact can be judged.

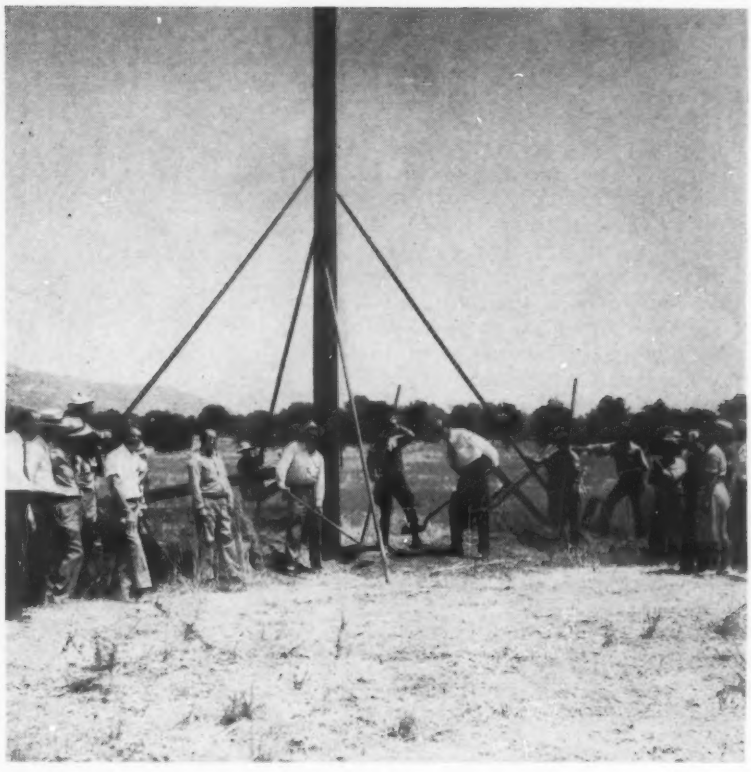
In Tables I and II it may be observed that a yield of only 550 lb. of plutonium from an original 10,000 lb. of uranium was assumed. An approximately equal weight of fission products would be formed so that the overall efficiency of uranium use assumed is only about 11%, the remaining 89% going out with the wastes. The process need not be so inefficient, but if it were, only ten tons of pure uranium per year would be required to supply 10% of the power that is used in the United States. A production of ten tons, or even 100 tons per year would not strain our resources for some time to come.

The chemical separation plants in the primary piles may actually be fitted out to reprocess plutonium from the nearby secondary piles and thus eliminate the need for many small reprocessing plants as was assumed in cost estimates. This presupposes the ability to move highly radio-active materials safely and cheaply, a situation which may be at hand. Certainly if small reactors are adapted to ships and submarines it would be to their advantage to have such equipment available in all the principal ports. If such an hypothesis proves practical, then the production cost estimates of electric power from atomic fission should be reduced a few per cent further in the more accessible locations.

The responsibility for construction and financing of primary piles is also very much beclouded. Since they can, almost on an instant's notice, be converted to the manufacture of plutonium suitable for the assembly of atomic bombs, the manner of operation is a matter of international concern. Who shall work out the plans for primary-pile installations and develop the final design? Who should decide upon the financial arrangements, and who should select the people determining operating conditions? These questions must be answered to the satisfaction of all the world, otherwise the development of atomic power can only mean a preparation for destruction. Scientists at Oak Ridge have expressed the opinion that any development of atomic power is "too dangerous" unless there is complete international agreement.

Since the technology of the primary pile is the least known step in the engineering picture, and since it has been represented as being the most dangerous socially, the subject of primary piles merits the concentrated attention of physical and social scientists, engineers, and statesmen alike. Ahead of the technologist are other engrossing questions yet awaiting study. The student of international relations will want to study the possible effects that air transport of plutonium may have on foreign trade. Public administrators will probably want to know the probable outcome of various policies of power distribution. The sociologist would like to discover the effect of cheap electricity on retarded cultures. The problems, especially the economic and administrative ones, are many. The time, estimated at five to ten years, is yet sufficient to make a fair start. If the facts are at hand and the fears of warfare sufficiently allayed, it is possible that atomic energy may be the first world-wide development to be rationally approached.

Total Rural Service



Setting the first pole on Sierra foothill project, July 27, 1945. Swinging shovels (L to R) are President Goyette and Vice-president Clingan of the Foothill Electrical Assn., and H. H. Courtright, manager of PG and E's San Joaquin Power division

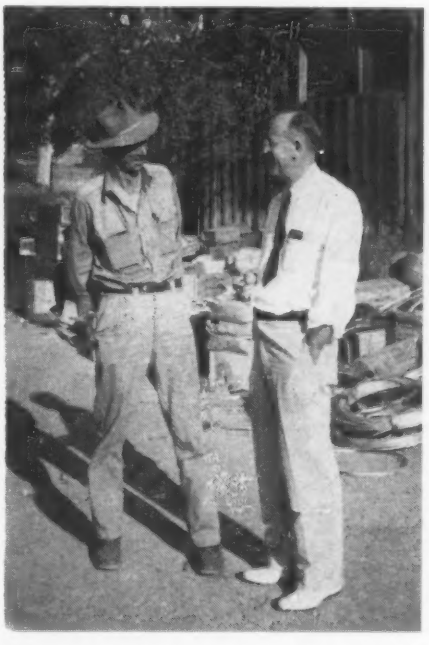
Far-flung project of the Pacific Gas and Electric Co. in the Sierra foothills east of Fresno, exemplifies programs dedicated to 100% rural electrification

THE West, which for years has led the nation in the electrifying of non-urban homes, is now witnessing the final phase of that effort—total electrification, applied to large, outlying regions. Several systems now have such projects under way, among them Pacific Gas and Electric Co. PG and E, which pioneered the application of electricity to farms to the point where it served more than 94% of the farms in its territory, is now at work on projects which will raise that figure to virtually 100%.

PG and E's Sierra foothill project is an outstanding example of complete electrification in an area where power service would have been considered impracticable only a few years back. The project covers miles of sparsely settled foothills lying between the San Joaquin Valley and the Sierra Nevadas, generally east and northeast of Fresno, mostly in the company's San Joaquin Power division. The most northerly part of the project (see map) is in the vicinity of Auberry, near the San Joaquin River, and is some 40 miles from the other extremity of the project in the region south of General Grant National Park.

Within this area are some 800 customers—743 according to the original development plan. These figures in comparison with the distances indicate the low density of customers per square mile.

Gradual development led several years ago to the initiation of studies as to the feasibility of providing the area with electric service. By 1941, these had reached the point where specific extension plans were being drawn up. Then the war forced PG and E to focus all its effort on maintaining existing system and providing service to war-essential loads. While this temporarily put an end to the company's ability to build, it did not halt the growing desire for service. This led citizens of the region to form, in July 1941, the Foothill Electrical Assn. Inc., which group began preliminary negotiations with the Rural Electrification Administration, looking toward construction of its own system. The group's activity consisted of considering various ways of getting service and studying the accomplishments of cooperative power enterprises elsewhere in the West. In January 1945, members of the association voted on the type of system to be set up and decided by a vote of 193 to 141 to enter into a contract with PG and E.



Foreman J. H. McLean (left) and J. C. Heaslet, assistant to Fresno district manager. McLean's gang moved in to string wire. Heaslet had tough job of coordination and customer relations

While contracting only with the association, the company also undertook the objective of serving an even larger number of non-members in the area, and to provide all with standard quality service at regular rural rates.

PG and E's ability to enter into such a contract had been made possible by the establishment of an extension policy known as Rule 15-A, which

gained the approval of the California State Railroad Commission. The effect of this rule was to double the free footage of overhead line which a California utility might construct—double in comparison with that provided by Rule 15, adopted in 1923. Under Rule 15-A, rural applicants for electric service from the PG and E need make no advance of money toward construction of the line by which they are served if the estimated total construction cost is not more than fifteen times the estimated gross annual revenue. Under this rule, PG and E could legally make the long jumps between the scattered farms and communities of the foothills region.

The contract provided that the company would proceed with the extension as soon as materials could be obtained. Accordingly, work was got under way at once, and the first pole was set July 27, 1945.

Administratively, the foothill extension is a single job, but physically it is a series of extensions. When existing facilities were taken into account, the most economical solution to providing the area with service consisted of numerous electrically independent additions. These included new 12-kv. lines from existing substations, and extensions of existing 12-kv. In the southern part of the system there is a loop with two power sources, but this is normally operated open and served on one side from Stone Corral substation, and on the other from Piedra.

Total length of new line, as the project was originally laid out, consisted of 258 miles of primary and 22 miles of secondary, a total of 280 miles. Some 20 miles of extensions to the original plan have been added.

The following tabulation of scheduled connections, considered in relation to the area, indicates the extent and density of load:

Number	Type of Service
373	15-amp., 2-wire
340	15-amp., 3-wire
11	50-amp., 3-wire
9	15-amp., 3-phase
7	30-amp., 3-phase
3	Power

The building of the added system was undertaken by PG and E's general construction department. As the work got under way it took on much of the atmosphere of a community enterprise as preference in hiring was given to local residents. Sometimes they had to take time off to tend to the harvesting of their crops. The initial effect of the project was to pour money into the region, both through pay checks and expenses incident to maintaining crews.

Although there was no skimping on construction standards, savings were effected wherever possible. Through

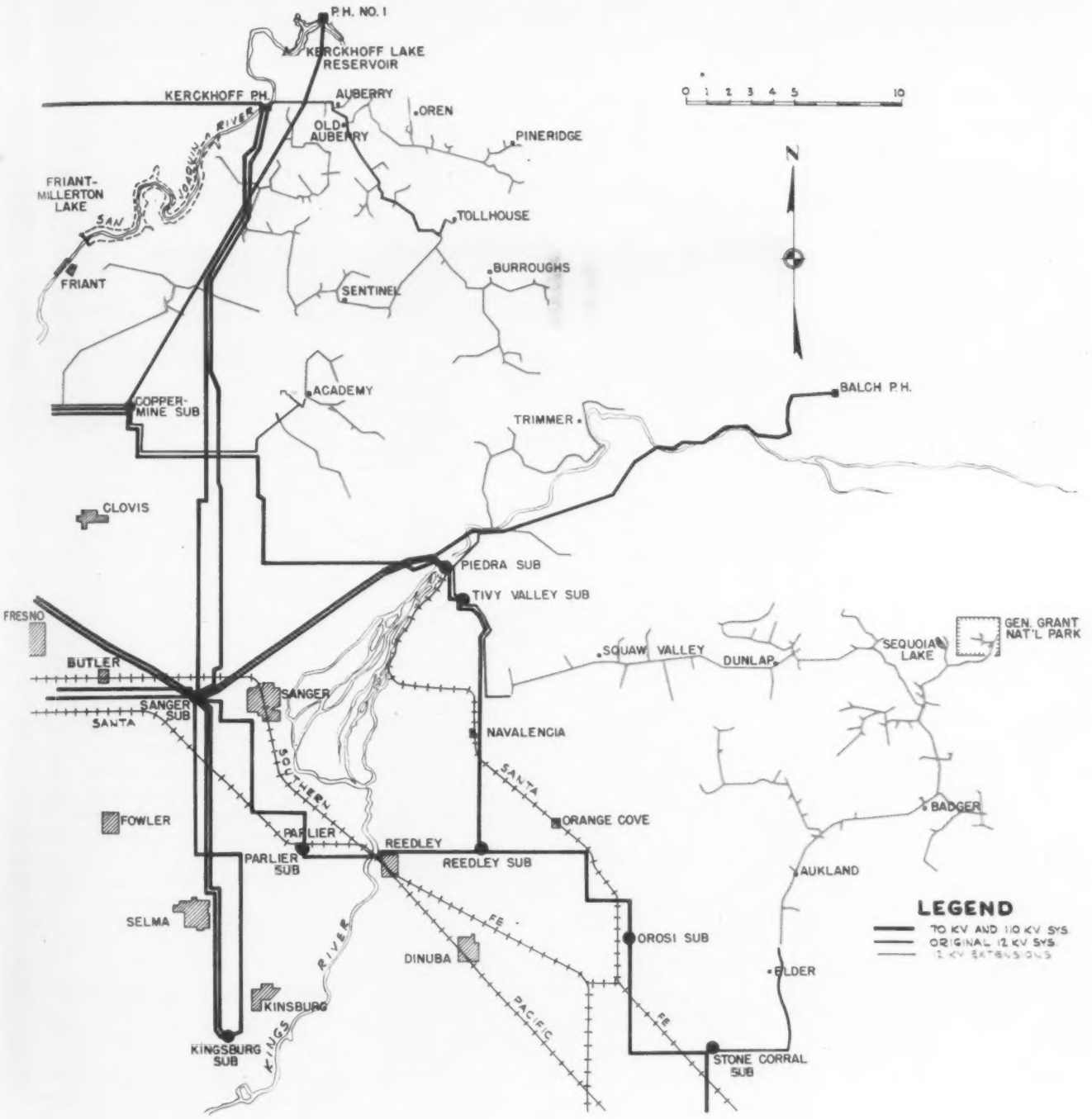
Cattle country surrounding C. M. Baker home, above, is typical of sparsely settled foothills region. Below, transformer is being hung near Auberry. Alex Purmal is on the pole, Burl Kitchen is on the rope, and C. S. Petersen is on the truck

brush country, for example, only a working trail was cleared along the right-of-way; for fire protection around poles, clearing was extended to a radius of 10 ft. Through tree areas, trees were felled and trimmed only to the extent necessary to provide sufficient clearance of conductors.

Ground conditions made it possible to dig 60% of the pole holes by machine.

The type of construction conforms to PG and E's non-urban standards elsewhere in the San Joaquin Valley. Poles are mostly 35 ft., set 5 ft. 6 in. deep; a few 40-ft. and 45-ft. poles were used. The original estimate called for 4,078 poles. Full-treated poles were used throughout, because they were available whereas others were not. Normal spans are 500 ft.

Of the total line, about 180 miles are below 3,000-ft. elevation and of light construction. Here, No. 2 seven-strand ACSR is used for primary main circuits, the same type wire, but in No. 4 size, for primary taps. Primary main circuits are carried on 4x6-in. by 8-ft. arms, single-phase primary taps on 4x6-in. by 6-ft. arms, with wood pins in both cases. Secondaries are mostly racked individually at 12-in. (sometimes 18-in.) spacing. Where secondaries are under primary, they are usually the same type of conductor as the primary. Second-



ary extensions in the light-load area are copper, in some cases strung on trees.

In general, heavy-load construction standards apply at elevations of 3,000 ft. and above. Heavy-load design affects about 100 miles of line. In the heavy-load areas, No. 2 eight-strand ACSR is used throughout, both for primary and for secondary, and both are carried on 4x6-in. by 8-ft. arms with steel pins.

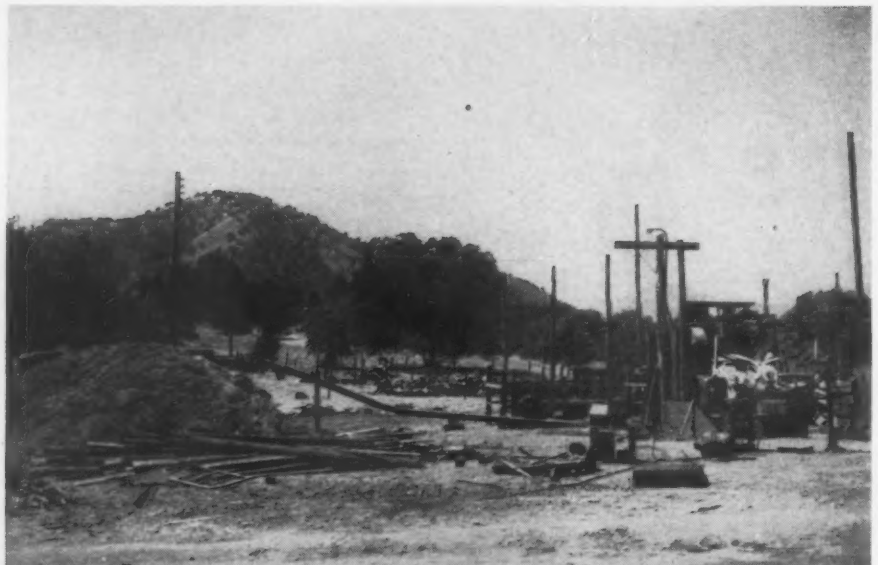
Heavy-load design is applied also to certain long spans, situated in light-load areas. Longest of these, carried on H-frames, occurs between Dunlap and Squaw Valley. It is 1,878 ft.

Transformers in general are 12,000/-120-240-volt, pole-bolted type, completely surge-proof, ranging in size from 3 kva. to 25 kva. The original plan called for 444 transformers, and more than half these were in 3-kva. size, another indication of the scattered nature of the load. Secondary trouble is cleared by the transformer breaker. Primary is protected only at the substation, except in a few cases where taps are provided with Kyle reclosers or fused disconnects.

Exceptions to the above transformer ratings occur where three-phase power customers are connected at less than 45 kva. In such cases, 7,200-volt, star-connected transformers are employed. If the load so connected exceeds 30 hp., it is served at 240-480 volts, and lighting is served separately by a fourth transformer.

Transformers have been the bottleneck throughout the job. Construction has pushed rapidly ahead to the point where the project is now 97% completed. Non-availability of transformers has, however, held customer connections to 70% (as of October) of those for whom extensions are being made.

In charge of the project for the general construction division has been R. A. Ransdall, engineer of line construction; C. M. Wilson and J. H. McLean have been the foremen on the job. All phases of the project except



Small lumbering operations in area below General Grant Park are typical of small power loads being picked up in foothills region. Shingle mill above is believed to be only one in the world sawing Sequoia Gigantia redwood. It gets its raw material from stumps of trees cut before the giants were protected

actual building have been handled by the San Joaquin Power division, of which H. H. Courtright is manager. This work included preliminary studies and the securing of rights-of-way, which were obtained without cost. J. C. Heaslet, assistant to the Fresno district manager, has had the special mission of coordinating local interests with division activities and with general construction work.

His job, like that of others connected with the project, has included becoming intimately acquainted in the new "neighborhood." In its surveys for the project, PG and E prepared maps which showed every structure in the area—information not previously available in up-to-date form. Indispensable to planning complete coverage, these maps also enabled the company representatives to locate, and become familiar with the needs of, each prospective customer.

Friendliness has developed through hiring of local labor, working out details of routes and service with the people concerned, alertness to individual emergency requirements, and special services.

An example of the last are the wiring meetings which have been sponsored by the company in the various community centers throughout the area. These meetings have usually been evening affairs, complete with refreshments and a special program for the kids. In a country where a man must drive miles to a meeting, he's likely to take the family along. Such occasions are among the few opportunities for old friends to see one another.

At such meetings, the steps which the customer should take to prepare for the arrival of electricity were carefully explained. Lectures, demonstrations, and movies were used to make clear what adequate and safe wiring is, and how the customer could secure it.

As service began to be connected, there turned up some interesting examples of how electricity helps a region grow. Small power customers, not originally counted on, were connected to the lines. Potential requirements are developing for connections to additional small industries and to resorts and homes which are being planned now that power service can be obtained. Most of the latter are, however, temporarily in abeyance because of building material shortages. Electricity has increased property values and inspired numerous improvements of existing properties.

Cost, originally estimated at $470,000, will probably exceed $600,000 by the time of completion. This reflects both rise in construction costs and increase in the number of connections. But the impetus which availability of power has given to the area indicates that the investment is a good one. And the communities involved can capitalize on this new facility without carrying the burden of debt.

Sierra foothill extension is an example of what Western utilities are doing to carry electric power to everyone, in every settled region of the West.

Transformer Standards

Standards for three-phase, pole type distribution transformers, rated 150 kva, and smaller have just been published by the EEI-NEMA joint committee. This follows two earlier reports, both dealing with single-phase units. The first covered single-phase, pole type units, of 25 kva, and smaller; the second extended single-phase ratings through 100 kva.

The third report covers mechanical features of both vertical and horizontal transformer types, and standards match those of the single-phase type for all ratings. They provide for maximum mounting interchangeability among three-phase ratings, and also among the three- and single-phase ratings. Many parts already in production for single-phase transformers now being built to follow the committee's second report will be put to use in three-phase transformers.

Copies are available at 50c.

Northwest Inspectors Report Progress

Code discussion shares program with economic, scientific and engineering subjects at first meeting in two years

A THREE-HOUR discussion of new provisions to appear in the 1947 Code, several technical and inspirational talks and papers on subjects related to wiring and inspection, an enthusiastic delegation of 125 registrants and a series of entertainment events, including golf tournament and banquet—these were features of the 20th annual meeting of the Northwestern Section, IAEI, in Boise, Sept. 23-25. This was the first meeting in two years and the roll call showed a good balance of old wheelhorses and new names and personalities.

Presiding responsibilities were shared by C. S. Alger, Puget Sound Power & Light Co., Seattle, president, and R. J. Larrabee, Underwriters' Laboratories, Seattle, first vice-president of the section. J. Carl Baldridge, Idaho Power Co., Boise, acted as general chairman of the local Annual Meeting committee.

A new chapter was added during the opening ceremonies by the presentation of a charter for the establishment of the Idaho Chapter to Fred M. Varney, chief electrical inspector of Boise, chairman of the sponsors who had applied for this charter.

The discussion of changes in the new code occupied the entire third morning sessions, with Victor H. Tousley, secretary, IAEI, as discussion leader. Tousley stated that paper and printing troubles had delayed the issuance of this revised code so that it would probably not come out until about the end of the year, and it will then be dated 1947 and will be known as the 1947 Code. He outlined the processes by which the code was finally proved by the NFPA and passed on to the American Standards Assn. for approval by that body. He stated that on account of the cost of revision and printing, the code would now only be reprinted every three years. There will be interim amendments in between printed revisions as the need arises.

He then started with Definitions and proceeded article by article to outline the principal changes in the new code. As he reached Article No. 340, the noon whistle blew, and the group went to lunch with the feeling that Tousley's summary, coupled with many questions and comments from the floor, had been a most instructive code discussion.

The only action taken on revision of the code was by resolution passed at the last session, protesting the action of the Board of Directors, NFPA, suspending the proposed provision for making the Type S fuse mandatory. This action followed two discussions of the subject: one at a general session in which James S. Mahan, representing Fusestat manufacturers, had been asked to report the process by which the NFPA had reached this decision; second, was at the Code Breakfast, at which general discussion led to the appointment of a special committee to draft the resolution referred to. The resolution sought also the concurrence of all other sections of the IAEI.

Advancement in the fields of science and engineering was given a prominent place at two of the addresses. C. S. Alger, section president, admonished the group that the association must keep pace with these advances in the electrical field.

J. J. Siddall, H. H. Robertson & Co., Pittsburgh, in his address entitled *Research and You*, touched on the theory of nuclear energy and urged that the inspectors be among the first to take advantage of the new order of things.

A particularly pertinent discussion of broad economic conditions and trends was offered by C. J. Strike, president, Idaho Power Co. Citing the marvelous cooperation between labor, management and government to secure adequate production during the war, he made a plea for re-establishing a similar working relationship between the segments of our population in conversion to peacetime economy. He showed how national income and national debt had both risen since World War I, and declared that we need not be too concerned about this. The problem is to keep them in proper relationship. Research will find new things to produce to build up our national income, he stated. It is necessary to create a friendly atmosphere around venture capital. This is needed to bring about the productive capacity we have to achieve to keep up our national income and support the debt. He also put in a plea for adequate compensation for labor, stating that an incenitve system which trains men to move up to take the places of others higher in the economic scale is a desirable adjunct to our industrial structure.

Presidential addresses by both B. C. Hill, Oakland, international president, and C. S. Alger, reported the growing membership of the association which now numbers more than 6,000. Hill cited the great contribution made by the association to revising the NEC through reporting the field experience of its members back through article committees to the Electrical Committee. Alger said there is need for universal acceptance of the code without material deviation, and that the association could do more to gain its acceptance than any other group.

Chapter reports by D. J. Wolters, chief inspector, Salt Lake City, for Utah, C. S. Alger for Puget Sound, and R. R. Grant, chief inspector, Havre, for Montana, indicated that a worthwhile activity had been maintained by all during the past two years. W. L. Gaffney, chief electrical inspector, Tacoma, secretary of the section, reported a net increase of 48 members since the last meeting. Later in the meeting he read applications from 20 additional members secured in the last month. His report as treasurer showed the section to be in healthy financial condition.

The report of the committee on legislation by F. H. Murphy, Portland General Electric Co., chairman, stated that a new Portland code, anticipating the changes to be made in the national code, was adopted Dec. 13, 1945. At the same time, wartime exceptions were continued to Oct. 15, 1946. An effort will be made in the state of Washington to revise its state law to provide for a permit system for districts not covered by city jurisdictions; for examination and licensing of journeymen; for an increase in contractors license fees from $50 to $100; for sales control; and prescribing the powers of the electrical inspection division.

A stimulus to the imagination was offered by the Disney-made technicolor film of Westinghouse Electric Corp., *The Dawn of Better Living*, shown through the courtesy of Idaho Power Co. by Al Gilbert of that company. In this were presented the many household uses of electricity to be available when production again gets into full swing, with emphasis on the wiring job that needs to be done and the part inspectors can play in extending the beneficial uses of electricity.

In a paper, *The Armored Cable*

Larrabee Gaffney Wolters

System of Wiring, H. M. Dreher, NEMA, traced the development of the armored cable from its introduction in 1897 to the present time, showing improvements in manufacture and in methods of installation. His paper was supplemented by a film. The discussion which followed brought out that trouble arising from the use of armored cable had originated chiefly in faulty installation.

L. B. McConaghy, NEMA, told of a public relations program being put together for the association, devoted to the education of the public on portable appliances, lamps and extension cords. The program might well be called "Electrical Safety Within the Room," he said. Material for the promotion of the program will be available shortly.

After one of the afternoon sessions, Howard Weber, U. S. Rubber Co., and other representatives of that company, told the story of aluminum building wires to the active inspectors, pointing out that the shortage of copper has made the use of aluminum desirable for interior wiring. It was pointed out that No. 12 aluminum is equivalent in carrying capacity to No. 14 copper and, with the new type R insulation, its over-all diameter is equivalent to the diameter of the No. 14 RC copper. The question arose as to whether aluminum could be welded and otherwise connected satisfactorily. A demonstration of welding and connecting was put on in the meeting room the following noon.

A discussion of instant starting fluorescent lamps by L. B. Johnson, General Electric Co., Salt Lake City, traced with charts the different types of circuits, ballasts and transformers used with both cold and hot cathode lamps. Johnson summarized his talk by cautioning inspectors to check for the proper size insulation of wire, the correct use of the safety circuit and socket on all installations under eight feet from the floor, the proper polarization of circuits, and the proper grounding of all fixtures, transformers, ballasts and accessories.

A. I. Sawyer, Idaho Power Co., Boise, speaking for the Idaho Safety Council, presented a paper on safety, putting in a plea for more friendly relations between labor and management relative to matters pertaining to safety. He pointed to the need for more inspectors to cover large territories under their supervision and for legislation covering wiring installations in areas not now providing for inspection. He said there was no general state code in Idaho governing electric wiring installation and urged the newly formed Idaho chapter to exert its influence to secure such legislation.

The Over-All Protection for Electrical Equipment was the subject covered by O. A. Alderman, Bussman Mfg. Co., Seattle, who, with the aid of slides, showed the advantages to be had from Fusetrons, which offer overload plus short-circuit protection, while allowing temporary overload such as is created by motor starting currents.

A graphic portrayal of the application of article No. 725 of the NEC to automatic heating systems was presented by W. W. Martinies, Minneapolis-Honeywell Co., on behalf of NEMA. Martinies demonstrated on a wired board the design of control circuits for an automatic burner. He gave a running account analyzing sections of Article 725 as they applied to these circuits, pointing out the differences between class one circuits and class two. The latter need not be metallically encased when such controls are used in a low-voltage circuit in which the current is limited.

Thomas L. Matney, chief state electrical inspector, Olympia, put in a plea for tighter inspection laws, and for placing electrical inspection under civil service or a merit system to keep its enforcement completely beyond political interference. H. N. Skow, Westinghouse Electric Corp., discussed the use of the new air-cooled transformers in industrial network systems. Tests on these transformers have indicated them to be safe for indoor use.

Proceeding to the election of officers for next year, the delegates found the

Donald Karlskind, U. S. Rubber Co., showing aluminum wire soldering methods

recommendations of the nominating committee to their liking, and elected for next president, R. J. Larrabee, Underwriters' Laboratories, Seattle; first vice-president, L. W. Carlisle, Oregon state electrical inspector, Eugene; second vice-president, Ralph R. Grant, inspector, Havre, Mont.; secretary-treasurer, W. L. Gaffney, chief electrical inspector, Tacoma.

On the executive committee are D. J. Wolters, chief electrical inspector, Salt Lake City; J. C. Baldridge, Idaho Power Co., Boise; J. Hyde Stayner, Utah Power & Light Co., Salt Lake City; R. A. Church, Puget Sound Power & Light Co., Seattle, representing the Electric Club of Washington; T. M. Widrig, Trumbull Electric Mfg. Co., Seattle; S. B. Clark, Northwestern Electric Co., Portland.

Elected to the executive council was Chester Kirsop, Olympia, and on the Electrical Committee as member, L. W. Going, Portland, and as alternate, W. L. Gaffney, Tacoma.

As to next year's meeting place, D. J. Wolters stated that it had been the intention of the Utah group to invite the section to Salt Lake City, possibly having a joint meeting with the Southwestern Section. However, since 1947 is the 100th anniversary of the coming of Brigham Young's band of settlers to the Salt Lake Valley, there has been an intensive campaign for conventions in that city, and it may be impossible to accommodate the meeting there during that year. Preference for Salt Lake was expressed by the delegates and the matter was left in the hands of the executive committee.

Changes Highlight Southwest Meeting

IT was a year of change for the Southwestern Section, International Association of Electrical Inspectors. Change in the officer staff and change in the National Electrical Code. The annual meeting held at Hotel Sacramento, Sept. 30, Oct. 1 and 2, provided the medium for this shift of phase.

Resignation of Harold L. Gerber, chief inspector, department of electricity, San Francisco, as secretary-treasurer caused a complete shift in the customary succession of officers and ended with the administration of the Southwestern Section very largely moved to southern California and in the hands of the more outspoken independents. Larry Trim, chief inspector, Burbank, jokingly referred to it as "the Civil War" as he took office as the new president of the section at the close of the three-day annual meeting. He had been elected president in lieu of H. G. Ufer, first vice-president, who stepped aside to become the new secretary-treasurer. Ufer is Western superintendent, Underwriters' Laboratories, with office in Los Angeles.

Two other important posts which went to southern Californians were alternate on the Electrical Committee to F. A. Short, department of industrial relations, state of California, Los Angeles, and member of the executive council to A. C. Veit, county electrical inspector, Los Angeles County. B. C. Hill was re-elected representative on the Electrical Committee from the section but he, as well as the vice-president of the section, M. C. Sandles, are both retired as well as both from the Oakland electrical division.

Other offices filled at the meeting were advancement of H. C. Moore, Modesto inspector, to first vice-president. J. K. Ross, San Bernardino inspector, to second vice-president and members of the executive committee, M. C. Sandles, retiring president, retired; H. V. Dobson, active inspector, Santa Barbara; H. K. Winterer, General Electric Co., Los Angeles; J. A. Hill, Pacific Gas and Electric Co., San Francisco.

It was the triumphal climax of a long career as an electrical inspector for Ben C. Hill, retired superintendent of electrical division, Oakland, to be president of IAEI. As a past president of the section and a member or alternate on the Electrical Committee representing it, he had always been active in inspector affairs. His presidential address touched upon various activities of the IAEI, calling attention to its unselfish and constructive nature and its program to improve the industry. Nevertheless, he urged that the association always be kept an inspectors' association and to this end recommended that study be given to increasing its dues so that it could be more independent financially. He also recommended that inspectors' compensation be increased to a balance with that of the electrical industry generally, because the inspector today must have a greater background of education and experience than was required some years ago.

Sandles Gerber

Tousley Wentworth

The program of the meetings had been specifically arranged by Gerber to cover the most important changes in the National Electrical Code. To this end, even the outside speakers were asked to discuss code subjects. V. E. Dodson and William H. Schiek, General Electric Co., San Francisco, presented *Fundamentals of Load Center Distribution* at the Monday noon luncheon, illustrating the changes in the 1947 edition of the code which permit placing of transformers in substations nearer the center of loads. Use of dry type transformers and unit substations permits more efficient distribution in large installations.

A new article of the code, No. 725, dealing with low-voltage control circuits, was discussed in the amplification to automatic and thermostatic control of heating devices such as home furnaces etc. Paul Neese, Perfex Corp., Milwaukee, dramatized his explanation of the changes in the code by means of a clever display board. By means of it, first, the very simplest manual furnace control system was illustrated and then added to it were the various features for automatic and thermostatic control, with proper safety devices for shut-off in case of fuel or other failures.

Harvey N. Skow, Westinghouse Electric Corp., San Francisco, explained the *Transformer Network and Load Limiter Ties* that are now per-

Hill Siddall Watson

mitted under Article 450 of the code. These ties are applicable in a network system, such as are commonly used in city distribution or in large industrial plant distribution.

Speakers from the National Electrical Manufacturers Assn., covering various phases, were also present. L. B. McConaghy of the portable cord division of NEMA and secretary of the public relations committee of IAEI, discussed the new public relations committee program to acquaint the public with proper use and safeguards of electric cords. Lesley D. Price, manager of the engineering department, NEMA, New York, also talked briefly discussing the handbooks of farmstead and residential wiring, recently issued by the joint industry committee. H. M. Dreher, engineer for the armored cable section of NEMA, presented a moving picture showing the making and the uses of armored cable in house wiring.

Another perennial speaker was Joseph Siddall, manager, H. H. Robertson Co., who gave an inspirational address on the effect recent atomic research may some day have upon electrical inspection.

Discussion of the changes in what will now be known as the 1947 edition of the National Electrical Code made up the liveliest part of the meeting. Gerber had prepared in advance a digest of the changes. These were used as a basis for discussion because actual copies of the new code were not yet available. Having present Victor H. Tousley, secretary of the Electrical Committee as well as of the IAEI, and M. M. Brandon, electrical engineer, Underwriters' Laboratories, New York City, opportunity was provided to put questions to these members of the Electrical Committee in regard to interpretations and purposes behind the changes.

In making his preliminary talk, Tousley stated that the delay in printing the code would result in its being called the 1947 Code instead of the 1946. Likewise, he said that the directors of the National Fire Protection Assn. had again set aside the mandatory requirements for use of Type S fuse as provided for in the new code and as voted by a large majority of the Electrical Committee. This latter action drew criticism and at the conclusion of the annual meeting a resolution was passed, similar to that passed at the Northwestern Section, protesting to the NFPA its arbitrary assumption of power over the majority vote of the Electrical Committee.

Another subject discussed at one of the code breakfasts brought forth action from this group. From the Northern California Chapter came a request that something be done by Underwriters' Laboratories to require plain labeling of all appliances bearing Underwriters' label or listing so that the inspector in the field could more readily identify them. While it was recognized that the body had no power to more than recommend, a committee was appointed by the new president to confer with Underwriters' Laboratories to see if something could not be done along this line. At the present time, inspectors claim, a great deal of time is wasted and confusion caused by the necessity to look up on Underwriters' cards or in the Underwriters' catalog to identify common items and appliances offered for sale.

On the sales control ordinances, William A. Cyr, associate editor, ELECTRICAL WEST and chairman of the committee of IAEI to prepare a manual for the guidance of cities wishing to institute unsafe appliance sales control, read from a preliminary draft and asked for suggestions.

At the code breakfasts where inspectors talk of their own particular problems, abuse of the permission to run temporary wiring during construction or change over was hotly discussed. Such temporary wiring, using old and worn materials, presents unusually great hazards and is particularly difficult to police. The wiring methods used by carnivals and traveling shows were also criticized, although constant inspection is bringing about a better condition.

Effort to get the state contractor's license board to make its examination for contractor's license conform more to those of city departments, now outlawed by recent ruling of the state supreme court, were reported upon by Ken Howard, of Southgate, chairman of a committee on the subject. C. R. Holland of Sacramento inspection department presided at the Tuesday breakfast and Harry V. Dobson, of Santa Barbara, the Wednesday.

High praise was given to Clifford Prud'Homme, chairman of the annual meeting committee, and his assistants, including M. S. Huggins, W. H. Welsh, A. Fryklund, Carl Anderson, Wilbur Horne, C. R. Holland, Clark Baker Jr., G. Hoffman and O. Seymour.

Short Ufer Trim Veit Moore

What Kind of Light Costs Least

Comparison of basic data for various types of units permits building up cost figures for all items of expense to show which can do a given job most cheaply

FIGURING of lighting jobs where various types of fluorescent and cold cathode are under consideration may be facilitated by the accompanying data. These figures were set up in easy-to-use form by S. H. Hazelton, G-E Lamp Dept., Oakland, for presentation last month to San Francisco Bay area contractor meetings

G-E will offer cold-cathode equipment in two sizes shown as soon as bases and lampholders are available, but for the present is confining its sales effort to installations where flashing or dimming is involved. Plans are also under way for a series cold-cathode lamp.

Table I shows comparative data for five types of lamps. Figures for the cold-cathode units are, however, approximate.

Table II shows the number, wattage and lengths of lamp required to produce equal foot-candles with the different types of lamps. These data apply to the special conditions stated in the table, but in comparative terms give a general indication of what may be expected in other, similar installations.

Table II—Lamps Required for Given Result

Conditions: To maintain 50 ft.-candles in a 50x20-ft. room with 10-ft. ceiling; ceiling reflection factor 75%, walls 50%, lamps mounted in a single-lamp aluminum louvered troffer

Source	Required Lamps (number)	Total Input (watts)	Total Length (feet)
Regular F, normal start	65	3,100	260
Regular F, instant start	65	3,505	260
Slimline, 100-milliampere	76	2,630	608
Slimline, 200-milliampere	45	2,930	360
Cold Cathode	69	3,770	552

Following is another comparison, from an analysis made at Nela Park, Aug. 1, 1946.

The requirement is to produce a given level of lighting over an 8,000-sq.ft. industrial area. Assumptions are as follows: a one-shift operation of 2,500 hr. per year; 16-2/3% average annual owning cost; 3,500°K white lamps; 70% maintenance factor; RLM industrial-type reflectors; 1c per kwh. for power; regular lamp life, 2,500 hr.; Slimline and cold-cathode life, 10,000 hr.

With these assumptions, the sums of the annual cost for energy, lamps, semi-annual cleaning, and owning work out as follows:

System Used	Annual Cost
Regular fluorescent, conventional start, four 40-watt white lamps per 8-ft. section, open and industrial type fixture	$1,590
Regular fluorescent, instant start, otherwise as above	1,730
Slimline, 8-ft., 200-milliampere, four per 8-ft. industrial type fixture	1,830
Cold-cathode, 3,500° white at 120 milliampere, 2,200 lumens per lamp, four lamps per 8-ft. industrial-type fixture	2,340

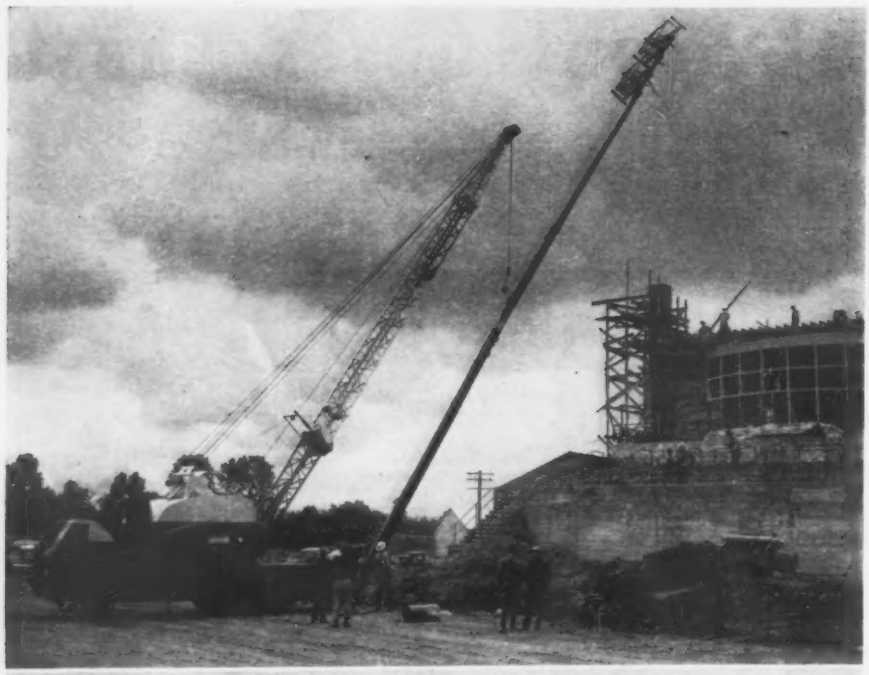
Table I—Light Source Comparison Sheet

	Six-Foot Cold Cathode	Eight-Foot Cold Cathode	Eight-Foot Slimline	Eight-Foot Slimline	Four-Foot Regular F With Starter	Four-Foot Regular F Instant Start
Color	4500 White	4500° K	4500° K	4500° K	4500 White	4500° K
Lamp Current (Milliamperes)	120*	120*	200	100	410	410
Lamp, Watts	37	45	51	29	40	40
Over-all Watts	45	54.5	65	37	47.8	54
Volts—Operating	340	420	290	335	108	108
Volts—Minimum Starting	600	750	750	750	200	450
Initial Lumens (at 10 hours)	1,480	1,980	3,050	1,800	2,100	2,100
Life (Rated Average)	10,000	10,000	2,500 – 4,000 – 6,000		2,500 – 4,000 – 6,000	
Bulb	T-8	T-8	T-8	T-8	T-12	T-12
Length (in.)**	72	96	96	96	48	48
Base	Single-pin, fluted	Single-pin, fluted	Single pin	Single pin	Medium Bipin	Medium Bipin
List Price	$2.00***	$2.70	$2.70	$2.70	$1.00	$1.15

* Or any lower current.
** Including two multiple lamp holders.
*** Tentative.

CORRECTION—

Sincere apologies to Lincoln Bouillon and others for a first-class mix-up on page 89, October ELECTRICAL WEST, which dealt with lighting Seattle's Bellevue Shopping Square. B. J. Heinz disclaims the credit reported, pointing out that the Frederick & Nelson job was engineered by Bouillon, fixtures being supplied by Seattle Lighting Fixture Co., and cold cathode installed by Tube-Art Display, Inc. The cold cathode is in coves, supplementing the illustrated main installation of 110 Pittsburgh 4-lamp, 40-watt units in ten continuous rows. Windows utilize 200-watt Pittsburgh mirrored reflectors above flush lenses. Food Center contractor was Nolet Electric Co., Bellevue.



They're Off!

The horses, not the lights. The lights are on, and brightly, at Portland Meadows track

NIGHT HORSE RACING is under way at Portland Meadows track, Portland, Ore., under one of the fanciest installations of sports lighting yet seen. It is a 584-kw. installation engineered by W. J. Matson of Portland, utilizing G-E "Yankee Stadium" floodlights, which, together with the associated electrical facilities, were installed by Tice Electric Co., and are served by Portland General Electric.

Lighting consists of 19 batteries mounted on 80-ft. steel poles. Soft ground made special steps necessary to provide firm footings for the heavy poles. Each pole is mounted on a 12x12-ft. pyramidal concrete footing, which in turn rests on four timber piles driven 40 ft. into the ground.

The light batteries are made up of 12 lights on the far-side straightaway, 18 lights on the turns, and 24 lights on the home stretch. Transformers, ranging in capacity from 25 to 50 kva., are located in partially sunken concrete vaults, which in most cases serve only the pole adjacent to which they are situated.

Each light unit is 1,500 watts, rated, but is operated at an over-voltage resulting in 1,740 watts per bulb. There are 336 lights in all.

Direction of floodlighting is against the progress of the race. This procedure keeps shadows from falling in front of the horses and gives spectators a clearer view of the race.

Portland Meadows is the first mile running track in the country to be lighted for night horse racing. There are two half-mile harness racing tracks in New York state equipped with lights.

First-hand reports from horse racing enthusiasts who've attended the Portland Meadows meet are that results are very, very good.

Top—Gantry crane raising 80-ft. light-supporting steel pole into position in front of partially completed clubhouse

Middle—Two of the 19 poles in the installation, in place with floodlights mounted but not sighted or adjusted

Bottom—Time exposure fails to show fast-moving horses but gives excellent impression of results. Lights are sighted to keep shadows behind horses

INSTRUMENTS NEEDED FOR ELECTRONIC MAINTENANCE

Maintenance is usually thought of as the adjusting, repairing or replacing of parts on an installed machine. But that is only one part of the problem—the means of "keeping the machine running". Maintenance should properly be thought of as including design, production and application as well. Such a view would forestall many troubles.

The user indirectly influences good design through purchase of machines which have been designed with maintenance in mind. The user can further influence good design by passing along to the manufacturer the results of experience gained in the operation of his equipment.

The proper application of the machine is a joint responsibility. The manufacturer provides the characteristics to the user and the user stipulates the conditions under which the machine will be required to operate. Adjustment, repair and replacement are chiefly the user's problem, but even here the manufacturer can be of help in establishing inspection periods and duties, and setting up stocks of renewal parts.

John Fiske
Westinghouse Electric Corp.
Los Angeles

IN maintaining electronic equipment, it is necessary to have an exact knowledge of circuit conditions. Test-lamps, ringers, etc., while useful in other work for obtaining such rough indications as whether a circuit is open or closed, are of no use when checking continuity in an electronic circuit, where the resistance may vary from several ohms to several million ohms. In circuits of this nature we must know exact values and to determine them requires instruments which used to be thought of as belonging to the laboratory. Shown in the table are instruments frequently used in servicing common types of electronic equipment.

The following is not meant to be a comprehensive survey but rather, notes on the more frequently needed instruments.

The basic instrument is a high-quality analyzer having an ohms scale and a-c and d-c voltage and current scales. It should be of the high-resistance type so that accurate readings may be obtained in low-energy circuits. It may be used primarily for checking circuit continuity and for measuring steady-state currents and voltages. Where insulation tests are to be made, the instrument should be supplemented by a megger. For example, a capacitor suspected of being shorted may not show up under the low voltage of the ohmmeter but will break down under the higher voltage of the megger. The meter may be further improved by the addition of a pointer-stop device which makes possible the measurement of peak as well as rms values.

A clamp-on ammeter is helpful in checking a-c loads without the necessity for breaking the circuit to insert an instrument. This saves considerable time on apparatus using tubes that require a 5-min. warm-up period every time the power is turned off. A clamp-on ammeter is also valuable for checking the consistency of firing in a-c resistance welding circuits.

The vacuum-tube voltmeter is a necessity when measuring voltages in very low-energy circuits, such as the grid circuit of an amplifier tube, or the voltage developed across the load of a photocell. The currents available in either case are so small (a few microamperes) that a voltmeter rated at 1 milliampere full-scale deflection acts as a virtual short circuit and no true voltage reading is possible. Vacuum-tube voltmeters are designed to take less than a tenth of a microampere on d-c and on power frequencies. Thus they are far more accurate where low-power circuits are involved.

There are many different types of vacuum-tube voltmeters. The most useful for trouble shooters is the peak-reading voltmeter with a scale calibrated to read rms values on sine waves. With this unit, peak impulses given off by saw-toothed oscillators, peaking transformers, multivibrators, etc. may be investigated, and, on the same unit, the usual sine-wave voltage may be read. A meter of this type is of little use, however, where non-sinusoidal wave forms are to be measured for effective values.

The electric "eye" of the service man is his oscilloscope. With it, he can render visible the voltage and current conditions within a circuit. Determination of magnitude, frequency, wave shape, polarity and phase rotation are but a few of the uses for an oscilloscope. Trouble can quickly and easily be located and analyzed by investigating the wave shapes in the troubled circuit with an oscilloscope and comparing these shapes with those obtained under normal conditions. An electronic switch is a useful auxiliary when it is desired to compare conditions in one part of a circuit with those in another or when there is considerable work to be done in determining phase relationships.

Type of Equipment	Analyzer	Clamp-on Ammeter	Megger	Vacuum-Tube Voltmeter	Oscilloscope	Electronic Switch	Wavemeter	Q Meter
Resistance Welding Control:								
Stored Energy	x		x		x	x		
A-C	x	x	x		x	x		
Electronic Motor Control	x		x	x	x	x		
Induction Heating	x		x	x			x	
Dielectric Heating	x		x	x			x	x
Photoelectric Control	x		x	x		x		
Voltage and Speed Regulator	x		x		x	x		
Rectifiers:								
Single-phase	x		x					
Multi-phase and Grid Controlled	x		x		x	x		

ELECTRICAL WEST

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Atomic Timetable

NO sooner had the atomic bomb gone off than the air was filled with speculations about the onrushing age of free power. Then more sober voices explained why atomic power would not be free and why, free or otherwise, its peaceful exploitation was years away. This certainly made things seem less tempestuous, but it left them hazy. Within the last few months, however, repeated flurries of fact finding have been gradually clearing the atmosphere, through which may now be discerned the outlines of possibilities ahead. It looks as if conversion of nuclear energy to conventional electric power on a self-sustaining cost basis might very well be an actuality within a few years.

In *Prospectus on Atomic Power*, page 55, are the conservative appraisals of a group of Western scientists. Their careful analysis of facts so far made known, contains definite indications of economic feasibility of atomic power plants very soon. As to physical obstacles, General Electric Co., hard at work at Hanford, expressed the conviction that all such obstacles would soon be surmounted. The same set of problems is being vigorously attacked by other groups at Oak Ridge.

As to enlightened speculation, some significant figures have been suggested by E. V. Murphree, executive vice-president of Standard Oil Development Co. Writing in *Mining and Metallurgy*, the journal of the society of similar name, he pointed out that the energy extractable from 30,000 tons of uranium by processes already understood would be eqiuvalent to 18 times the known U. S. oil reserves. He also noted that should the cost of normal uranium get down to $4 per pound, it would be be equivalent to 18 times the known U. S. oil re-

Reappraisal of atomic power as an energy source for electric utilities appears to be in order.

Engineers Seek Economic Redress

IS there a distinct line of cleavage between the professional ethical aspects of engineering and the economic welfare of the men who qualify as engineers Can the existing professional engineering organizations adequately promote the former and at the same time protect the latter? Those engineers, who by the nature of their work, have been subjected to the interpretations and applications of labor laws which would make them trade or craft unionists, have decided that there is such a distinction and that the professional societies are inadequate. After years of hope, years in which there have been endless study and controversy, these men regretfully find that they must seek economic protection and salvation elsewhere.

In a concerted effort to promote and protect their economic welfare and professional status and their right as professional employees to bargain collectively through an agency of their own, engineers heretofore banded together in local associations in various Western cities have now formed a national organization. In San Francisco last month they set up the National Association of Engineers, Architects and Scientists. Avowed purpose of the association is to bring together isolated groups throughout the country in one organization for mutual aid in solving their common problems, to achieve agreement as to general principles and procedures and to gain the advantages of concerted effort and nation-wide recognition in the attainment of their objectives.

The new organization promises to take cognizance of the pitfalls which have beset local groups in the past. By proposing to represent all professional employees and by careful definition of those whom it does propose to represent, the organization seeks to escape the fate of those groups which have failed because courts have refused to recognize the validity of distinctive membership claims. Here is the definition of a professional employee adopted by the new association: "an employee who possesses a knowledge of materials, equipment, mathematics or the physical and natural sciences and who applies such knowledge in the planning, design, construction, development, or use of structures, machines, products, processes or

projects and whose work is primarily intellectual and requires the exercise of judgment, is creative and is of such character that the output produced or the result accomplished cannot be standardized."

Most engineers appreciate the dire necessity for a professional organization that will accomplish those economic ends which the present engineering societies ignore. All engineers should hope, as do we, that this new association will succeed.

Housing Is FUBAR

HOUSING for veterans must have been selected as the political appeal that would make the most votes and line up the house-hungry veterans and their families behind the bureaucratic system which had grown during their absence at war. But veterans' housing has become so entangled in its own regulations that it is strangling itself and choking as well the manufacturing economy of the country. The houses that are built will never be equipped with appliances to cook on or to serve the owners if all the steel in this country is withdrawn from appliance manufacturers in order to make more sewer pipe and cast iron bathtubs. Thousands of homes will be ready for occupancy but there will be nothing to cook on and in many instances the utilities will not even be able to serve them electricity because they cannot get needed materials to extend their lines.

To add to the snarl, OPA has set arbitrary overhead and profit margins on the construction industry. These are of so low a percentage that any honest contractor who wants to operate within the law can do nothing but refuse to take on any new construction work. Further, to force the issue, materials for repairs and parts have been so frozen that the contractors cannot do this type of work either.

The construction industry will be accused of calling a strike on housing and political charges and countercharges will be bandied during the fall election session, but the quotas for housing set up by Mr. Wyatt have fallen far short of being met. They are snarled up in red tape of his own making.

The situation illustrates again that there is no body of men wise enough to control the economy of as complex a nation as this. Clamping down the lid on one segment causes the pressure to shift and blow out elsewhere.

The men in the armed forces, imitating the official initial terminology applied to various operations or departments, coined a few of their own. SNAFU represented "situation normal, all fouled up." The extreme of fouling they termed FUBAR, meaning "fouled up beyond all redemption." Housing earns that designation right now from the government which is attempting to create it.

Installation Costs Stop Sales

ONE situation which may make or break the appliance industry is the rising cost of installation. In his keynote talk to the International Association of Electrical Leagues, Victor Hartley, PCEA managing director and president of the IAEL, brought out this problem as one for the entire industry to solve. He summarized the situation in this fashion:

"We shall never sell electrical appliances on a mass-market-basis while installation costs remain at their present high level. I do not attempt to place the blame for these prices—in fact if there is actually any 'blame', as such, it is probably pretty evenly distributed over numerous shoulders. My point is just this—IF the inspectors' code standards are not too high; and IF labor's wage scale is not unreasonable; and IF the contractor is not asking undue profit; and IF the manufacturers' and wholesalers' prices are not out of line, then the cost of installing appliances is where it should be—it cannot and should not come down, and we might as well make up our minds that our product is a class product and will never have a very general public acceptance. If such is the case we should revise our thinking, and all of our merchandising and advertising plans. BUT—if any one of these "IFS" is a false premise, or even a questionable or debatable one, then I say, unequivocally, that the entire industry had better get together and straighten out the difficulty. * * * If the great mass of the public ever decides that it wants to live electrically, but to do so must pay tribute to prejudice, ignorance or greed on the part of one or more branches of our industry, we shall suddenly find that we have laid ourselves wide open to a return of those unwelcome, distasteful government controls from which we are just gaining a measure of freedom."

IN the judgment of a worker, the man above him is a "good boss" if he possesses the following qualities and characteristics: Knows his job thoroughly . . . . Maintains a friendly attitude . . . . Is loyal to the men above and below him . . . . Practices fair play . . . . Appreciates honest effort . . . . Gives instructions clearly . . . . Believes in and practices safety . . . . Is considerate of others . . . . Has leadership ability, rather than "drivership" . . . . Controls his temper . . . . Possesses the foresight to plan . . . . Is consistent . . . . Keeps his mind open . . . . Keeps promises . . . . Refrains from "bossiness". . . . . How do you think your workers would rate you on these qualities?—Glenn Gardiner.

IF you could send your own special representative, a trained and keen observer with a real knowledge of what it is *you* want, you could not pick a better man than San Diego dealers have to do just that job for them. J. Clark Chamberlain, manager of the Bureau of Radio and Electrical Appliances of San Diego County, never just goes anywhere for the ride. He sees people. He talks to them. He looks for trends, tips, significant information to bring back for his members.

So when he went as a director and delegate to the annual meeting of the International Association of Electrical Leagues at New York, Oct. 2-4, he made it his business to see and talk to more than 20 manufacturers' executives in the radio and appliance business.

What he found out the dealers and distributors in San Diego were eager to hear. They called a special meeting of all members of the bureau at the U. S. Grant hotel on Oct. 10 to hear their manager's report.

ELECTRICAL WEST feels particularly proud that Chamberlain has written this same report in compact, concise, meaty form so that you, too, as a dealer or distributor throughout the West, may sit in to learn what his keen observations were. His ability to digest and appraise what he observed is a real asset to the appliance industry of the West.

"My manufacturer contacts numbered about twenty," Clark wrote. "Not all were made at the plants, some being with executives whom I met at points away from their home operations. But I had ample opportunity to see the production lines of enough radios, ranges, refrigerators, washers, dishwashers and all types of small appliances to gain a clear picture of the problems that confront most of our industry's producers. Should have included television, also, for I did have the opportunity at RCA to view their television production line under way—first outsider to be so honored—and also obtained a good picture of what Dumont Laboratories are doing."

"What Twenty Manufacturers Told Me—"

J. Clark Chamberlain
Manager, Bureau of Radio & Electrical Appliances of San Diego County

THROUGHOUT my manufacturer contacts there ran a pattern of materiel lack, difficulty with sources of component supply and some labor difficulties. Steel was the most common bottleneck, with many producers working on almost a day-to-day basis, but copper, controls, switches and a host of other items came in for their share of mention. Few of our own industry's plants have had direct labor difficulties recently, but all were vulnerable to strike conditions prevailing in the countless other industries upon which ours have had to depend for parts and supplies, as well as raw materials.

But despite the mental anguish of having to operate almost from day to day (one manufacturer described it as living from "crisis to crisis") I found that production, generally speaking, was on the *increase* rather than the decrease. Furthermore, the cold production figures, which no responsible executives seemed disposed to challenge, disclosed that all-time peaks were being reached in most types of equipment, with refrigerators, sewing machines and certain minor items the only exceptions.

Also I discovered that, despite what we hear, the productivity of labor in our industry's plants is gradually improving. There were exceptions, of course, but fully two-thirds of our people testified that efficiency was climbing, and in three plants the admission was made that the productivity level had already risen to that of the prewar period.

Opinion as to the outlook for strikes or general labor troubles in our plants ran about the same way. About two-thirds of our manufacturers believe that less difficult conditions, with fewer strikes, will mark the final quarter of this year. Here again, one swallow doesn't make a summer, and you could be way off by taking the observations of only a few men. I believe in averages, however, and the majority clearly feel that easier labor conditions are ahead.

On my rounds this time, I encountered much less talk about new "superduper" appliances than at this time a year ago. In fact, several concerns which had been talking about introducing quite revolutionary equipment seemed to have largely discarded such ideas for more conventional ones. Guess they have enough difficulty trying to produce more or less standardized equipment.

There was considerable evidence of badly unbalanced inventories in some places; in fact this appeared to be an almost inescapable by-product of the conditions under which appliance manufacturing must now be carried on. Some of this difficulty came about through the lack of one or more minor parts or pieces of equipment which had been momentarily expected, while production went on. Thus without having planned it that way, it has been necessary for some manufacturers to employ considerable warehouse space to store equipment which could be instantly dispatched to dealers—if some insignificant part or component could be secured. This problem of unbalanced inventories could become very critical, financially speaking, for any not-too-strong concerns finding themselves plagued with such a condition.

One point on which practically all executives in our field seem to agree is that the buyers market is heading up a great deal more rapidly for most appliances than seemed possible a few months ago. None will argue that we don't have a strong buyers market now on table model radios, or on vacuum cleaners. Some freely predict this condition will be apparent early next year in relation to home freezers and that even refrigerators may *have to be sold* in the last half of 1947.

With this sentiment shared by so many, it is easy to understand why every manufacturer I contacted urges that all possible effort be placed on sales training now, to help prepare for the buyers market which some see is practically upon us and others con-

cede is not more than a few months away.

On the score of television, I found excitement over the profit possibilities of this industry running high in many places. Half a dozen manufacturers, mostly in the East, were turning out sets in some quantity, with one producer actually having a full-scale production line which I saw in operation. Many wild figures of 1946 television production have been made, ranging as high as 100,000 units.

My observation would indicate 40,000 to 50,000 would be tops for this year, but look out for next year! A couple of million units are easily attainable (though one of our leading manufacturers has estimated four million is possible) for a two-year period.

So far, no sets actually in any quantity production are combination units for both television and radio. The vast majority of the units being turned out are for television sight and sound only. Soon, however, several of the present producers of such equipment *plan* to introduce models with AM and FM to accompany television.

Practically all of the sets to be produced this year will be merchandised in the four present television centers, of which Los Angeles is one, but with so many construction licenses having been granted for additional stations, manufacturers freely predict a great widening of this presently restricted market after the middle of next year.

I found radio manufacturers most appreciative of the current table model radio campaign now being carried on by our bureau. It was interesting to discover, also, that this campaign is the first cooperative promotion since prewar days to actually *sell* some appliance. Even those manufacturers whose products have been very slow to reach this market were enthusiastic over the objectives of this campaign.

I came away from this current sequence of manufacturer visits with more respect than ever for those who are trying to make the equipment we are so anxious to sell. It is my conviction that most dealers do not begin to appreciate the complex and almost limitless problems under which appliance manufacturers have been operating. And seldom knowing of the almost hopeless conditions with which many of our producers have had to cope to get appliances rolling, we have failed to give due credit for a quality of resourcefulness which finds the answer to most of the obstacles that plague steady production.

I do not expect to see any rapidly increasing flood of appliances and equipment this fall, but my observations have convinced me that there will be gradual improvement from here on out, and that's about all we can ask for.

Thor Plant Rolls

Automagic washers made now in El Monte factory

Heartwarming it was to see a busy assembly line actually producing one of the postwar automatic appliances much in demand for the Western trade. This sight was granted a number of invited guests Sept. 24 when Ed Hurley, chairman of the board of Electric Household Utilities Corp., Chicago, held a special executive preview for the unveiling of the new West Coast plant of Hurley Machine Division at El Monte just outside of Los Angeles. This assembly line was turning out the new Thor Automagic washers and, if it can be kept running, will mean samples for dealers shortly, and thereafter a continuing supply of stock. The plant is geared to produce 300 Automagic washers, and eventually also 200 Gladirons per day.

Employees have to be trained first, production line difficulties solved and parts brought in. Tanks are made locally by Norris Stamping & Mfg. Co., of Los Angeles, the remainder of the washer coming from the Cicero, Ill., plant of Thor.

The factory is to serve the eleven Western states in accordance with the new Hurley policy of devoting the main plant in Cicero to the production of parts and making assemblies at various plants, such as: El Monte, Calif.; Toronto, Can.; East Palestine, Ohio; Paris, France; later, London.

John Gunderson, general manager of the new plant, and sales manager for the district, was host to the preview and the opening ceremony on the twenty-fifth.

E. N. Hurley, Thor board chairman

The new plant covers 50,000 sq. ft. of ground and provides for adequate contemplated expansion. It will have an estimated annual pay roll of $500,000.

● Business Planning Institutes were begun by the Distributive Education Service of the California State Department of Education, in Richmond recently. Preparations for institutes in nine northern and sixteen southern California cities are now being made, Earl H. Kieselhorst, has announced.

Off the assembly line the new combination washers and dishwashers go into crates for shipment to the West

PORTLAND BANK STAGES BIG APPLIANCE SHOW

MORE than 80,000 people in the Portland, Ore., area gave concrete evidence of their interest in things electrical by crowding the Home Show, staged by the First National Bank of Portland at the Municipal Auditorium, Sept. 20 to 22. The public was not alone in this interest, for 600 persons, representing dealers from the surrounding trade area, attended the preview on Sept. 19.

It was a wholesale display put on by 23 distributors under general sponsorship of the bank. William Bell, vice-president of the bank, was in charge of this unique promotional event. The bank itself was interested in developing installment loans on merchandise whenever it becomes available and offered 18,000 sq.ft. of booth space to the distributors for their displays. No orders were taken; it was merely to acquaint the public with what is coming.

Exhibitors and some of the things they showed are included in the following:

General Electric Supply Co. displayed a complete electric kitchen.

Harper-McGee Inc. showed new models of Kelvinator, Bendix, RCA Speed Queen and Fowler water heaters.

Marshall-Wells Co. displayed the Youngstown kitchen and Zenith radio.

Western Supply Co. displayed General Motors heating equipment.

Borgelt Supply Co. showed the Farnsworth radio and the Coolerator as well as a new electric air heater called Co-Z-Air.

Household Distributing Co. also showed Bendix, Marion ranges and Seidelhuber water heaters.

Graybar had a display of a Hotpoint kitchen, Stewart Warner radio and Automatic washing machines.

Lou Johnson Co. displayed Admiral appliances, Simplex ironers, Wesix heaters, White Cross appliances and some gas appliances.

Appliance Wholesalers displayed the Philco line.

Huletz Electric had Stromberg Carlson and Jacob's Launderall.

Maytag Co. had on display its washers and freezers.

Hoover vacuum cleaner was also on display.

F. B. Connolly Co. showed lines of Majestic radios, Norge, Hamilton clothes dryers and Ironrite ironers.

Stubbs Electric Co. had on display the Blackstone washer, Electromaster ranges, Deepfreeze and National water heaters.

Westinghouse Electric Supply showed the Westinghouse lines.

C & H Supply of Seattle had One-Minute washers, Motorola radios and Amana freezers.

Field Sales & Supply Co. displayed Crosley radios and A. O. Smith water heaters.

Sunset Electric Co., Frigidaire distributors, showed that line as well as Emerson radios, ABC washers and ironers, Proctor appliances, Premier vacuum cleaners and Vornado fans.

Central Appliance Co. exhibited Gilfillan radios, Rheem water heaters, Economaster electric heaters and Chest-O-Freeze home freezers.

Electric Distributing Co. had on display Gibson refrigerators and ranges, Apex washers and ironers, Zenith radios, Duotherm heaters and Clark water heaters.

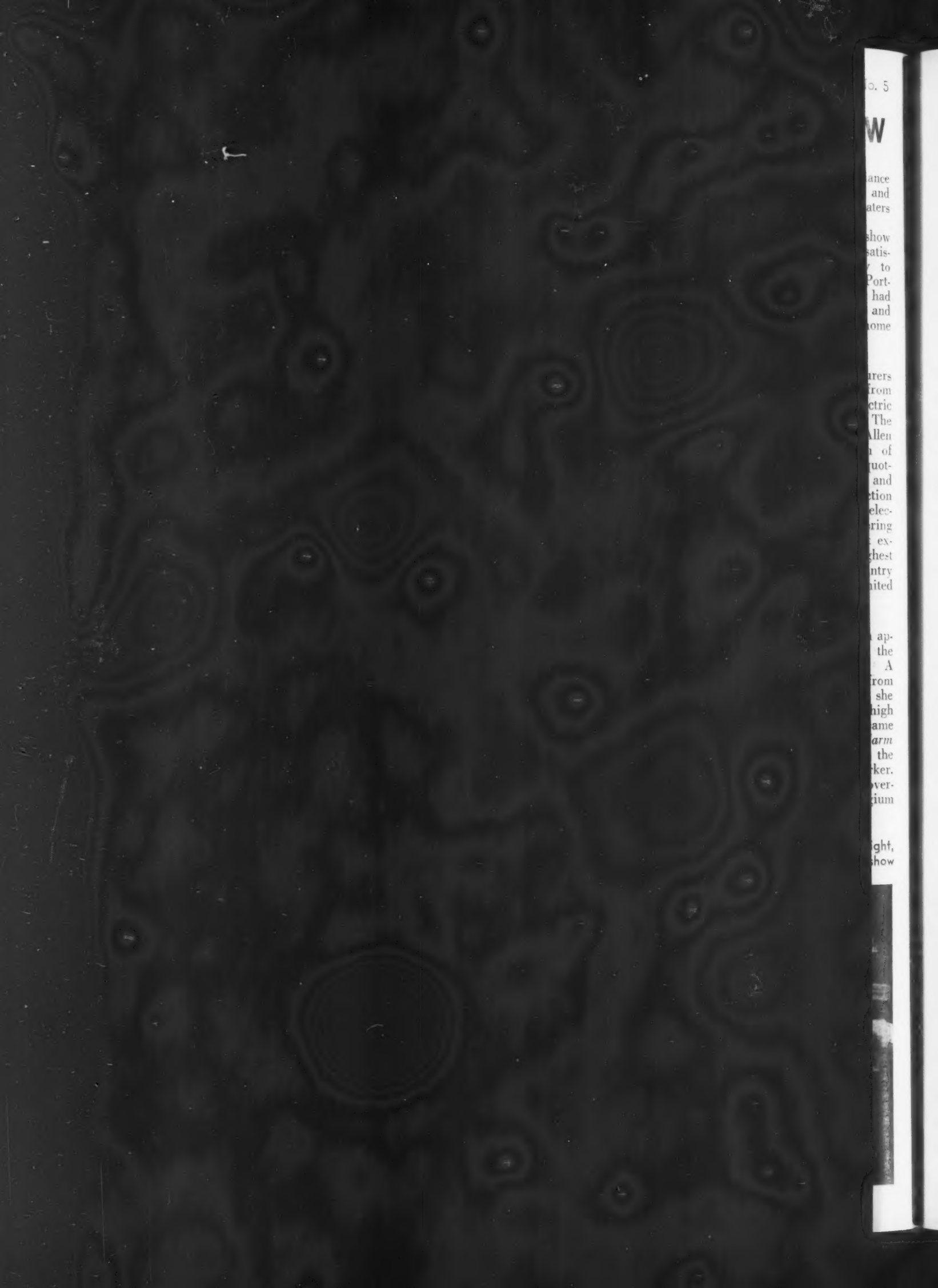
Pacific Coast Heating & Appliance Co. showed the Presteline ranges and Elgin kitchens, Mission water heaters and Sunkraft lamps.

At first objecting to holding a show when the public was already dissatisfied with the dealers' inability to deliver appliances, the trade in Portland felt after it was over that it had done a great deal to restimulate and keep alive the interest in these home appliances.

● ALL 22 electric range manufacturers received a telegraphic request from Seattle for greater allocation of electric ranges to the Pacific Northwest. The telegram was signed by David L. Allen Jr., secretary of the Association of Appliance Dealers, Seattle, who quoted population increases since 1940 and the large increases in the construction of veterans houses all demanding electric ranges. "We protest pioneering new area markets at this time at expense of Northwest which has highest per capita electric usage in country made possible by cheap and unlimited power," the telegram said.

● RUTH MARION STRONG has been appointed home service director for the San Diego Gas & Electric Co. A graduate in home economics from Montana State College in 1941, she taught the subject at the junior high school at Great Falls, later became assistant food editor of the *Farm Journal*, and in 1943 served in the Red Cross as a recreational worker. While on this assignment, she saw overseas duty in England, France, Belgium and Germany.

Left, William Bell, vice-president of the sponsoring bank, and H. S. Wiggers, G-E Supply Corp. sales conselor at Portland, in the supply company exhibit. Right, a typical scene, indicating public interest in the show



ELECTRICAL WEST Sales Guide

NEWS LETTER FOR THE ELECTRICAL MERCHANT OF THE WEST

November 1946 ©

Steel priority denied

From our Washington news bureau comes word that CPA has turned down the appeal of the electric range advisory committee for priorities to stove manufacturers for steel. No, said Small, veterans' housing must take it all, though with what the vets will cook or store food once they get a house remains unanswered. Meanwhile range and refrigerator manufacturers are reaching the bottom of the pile quickly and deliveries of large appliances made of sheet steel are slowing down. Even the gas range manufacturers are starved for steel.

Six unit range

Although Thermador of Los Angeles has announced a new six-unit, two oven range, along with other electric range models, these are dependent upon delivery of steel before they can be manufactured. Harry Fogwell was not optimistic as to when that would be. Heater production is good apparently, however.

Brands preferred

Although household irons started first, there are still too few of the best known brands to satisfy dealer demands. The public is becomming choosey and is not buying the unknown brands which seem to be abundantly displayed, even "specialed."

Still not good

Mixers and toasters, wholesalers say, are arriving in slightly better quantities. Spread out among the far greater number of dealers the quantity available is far from satisfactory.

Next Market

Western Winter Market dates have been set by Western Merchandise Mart, San Francisco, as the week of Feb. 3-8. Theme will be "Building Ahead". Frank Runyan, Mart president, believes that by then increased production will make it a far more active market than the last.

Ask freedom

The radio industry has asked for decontrol as number of sets produced in August reached 1,500,000, and more than that in September. The best prewar rate of production was 400,000 per month. That rate was reached in July.

For sale, not a sample

Vacuum cleaner manufacturers called John Small, CPA head man, for including cleaners in the list of appliances that women cannot expect to obtain for awhile. Bret Neece, president of VCMA, cited figures to show that vacuum cleaner production is at an all-time high. He felt that Small's talk might create the impression that none were for sale, and now they are.

Speakers at the recent National Retail Dry Goods Assn. urged dealers to take quick losses, if necessary, on underquality goods now to avoid carrying them as dead inventory later. Others also advocated taking full markup on all lines in order to offset reductions on the poor quality ones. Also stressed was the advisability of more turnovers as a means of holding profits against rising operating costs. — Applies to all merchants

Freon supplies are dangerously low because cylinders are kept too long, manufacturers say, pleading for their return. The hoarding habit acquired during the war, the NARC says, has caused many repair shops to order large tanks rather than small and thus tie them up for a long time. — Freon freeze

Elmer J. Weinheimer, of 8220 Santa Monica Blvd., Los Angeles, has been appointed refional field director for the National Electrical Retailers Assn., says C.C. Simpson, managing director. — NERA man

Thermador Electrical Mfg. Co. of Los Angeles, has just bought the Rotom Mfg. Co. of Alhambra, makers of fractional horsepower motors for use in fans, heaters, pumps, recorders, coolers, etc., according to Bill Cranston, president. — Assured of its motors

Singing telegrams passed out but Voco Inc. of New York will soon put out a line of vocal greeting cards on small, mailable plastic records, sung by name performers. — Croon

Another record company in Hollywood is to make "Audience Records" during popular comedy programs, complete with audience reaction, and probably commercials too, to be sold for home consumption only. — Repeat shows

General Electric Co. will soon offer a new electric clock with a built-in timer, on the minute-minder idea, for timing eggs, pressure cookers, etc. — Timer

Wendell H. Kinney, one of Kinney Bros., Los Angeles distributor of Presteline electric ranges declares that they are very much in existance now, and that their dealers say they create great interest when displayed. Jack Hargrove, sales manager, recently resigned to become executive vice-president for Miracle Electric Co. in Chicago. — Exist now

A new automatic washing machine, called Akka Top-Flow, will be made by Barlow & Seelig for Appliance Corp. of America, its national sales distributor. Said to need only 10 gal. of hot water it can be used even where there is no water heater, using stove-heated water. — Another soon

Philco has just put out a 140-page, magazine sized, manual for the servicing of television receivers. Though premature for the West, the promise of several stations soon will make this manual something any radio service shop should have. — Video manual

Electronic Specialties Co. of Glendale Blvd., Los Angeles, has an inverter to turn 110-volt AC to DC so that users of electric shavers will get smoother performance and higher speed. — DC for shavers

Lewyt Corp. of Brooklyn, a contract manufacturer of radios, may bring out a line of vacuum cleaners next year. — Cleaners

Howard Industries, Inc., of Racine, Wis., plans to bring out a line of small appliances, including fans, food mixers and others using fractional horsepower motors made by its parent, the Electric Motor Corp. — Motor driven

Among the new sales promotion tie-ups Tide reports that a record company and a cosmetic company will soon spring a new promotion stunt. Meanwhile Sylvania is already tied-in on a glamor deal with Dalettrez Inc., makers of a face cream to be used with the reflector heat lamp, suggesting that the beauty-conscious ladies may give themselves a salon facial at home with this cream and the "Cosmitron" lamp. — Hot beauty

Cory is now ready to supply coffee-maker dealers with its "mat of the month" for local advertising. — Ads

Federal Telephone & Radio Corp. has a new selenium rectifier to sell at about $1.60 designed to replace the rectifier tube in AC-DC radio sets. It warms up instantly, runs cool, is unbreakable and lasts the life of the set. Will be adaptable for replacement of tubes or used instead of them in new sets. — Radio tube obsoleted

Raytheon, maker of tubes in Waltham, Mass., has a new high-frequency cooker, in two sizes, to quick-cook hamburger and hot-dog sandwitches, or to cook complete frozen meals on airplanes or railroad trains. It uses the magnetron tube. — Hf quick cooker

Zenith, so 'tis said, may soon startle the industry with a new super table model radio incorporating both AM and FM, AC or DC, to retail around $60. Remember how it hit the hearing aid market with a low-priced model. — Up the sleeve

Colonial Radio, owned by Sylvania, has designed a new special line of radios to be sold by and carry the Sears Roebuck name. Many will be produced by the new plant in Riverside, Calif. — Sears radio

Blackstone Corp., which had an automatic washer before the war, has sent samples of its new model to its distributors, among them C.G. Hamilton Co., at Western Merchandise Mart. Top loading, with a horizontal basket, the total cycle has been cut to 25 min. — Back again

Muncie Gear Works and Terra Temp Co. of Indianapolis are said tobe working on heat-pump heating system to offer soon. — Reverse cycle

Bendix showed its new gas model clothes dryer at the recent American Gas Assn. convention. With a capacity for 18 lb. of wet clothes, it runs with a ½-hp. motor, has gas pipe capacity for 20,000 btu per hr. — Gas dryer

Fowler & Jewell, Los Angeles distributors, were given the Pacific Coast representation for the Koiled Cord produced by the Kellogg Switchboard & Supply Co. of Chicago when R. C. Krueger, manager of the division was West last month. It will be sold through wholesalers. — Koil men

Edward F. Hale Co. appliance distributor of San Francisco has opened a branch on South Virginia St. in Reno, of which Ken Williams will be in charge. — Branch

Zenith distributors of the West were recently given a special service course by Frank Smolek, national service manager. Particular emphasis was paid to the operation of the new Cobra Arm pickup and two new record changers. Bryan Moranic, assistant service manager, accompanied Smolek.

Cobra service

A new silicone paint, resistant to weather, chemicals and heat, has been developed by General Electric Co. for use to finish refrigerators, ranges or hospital equipment. Derived from sand, it is tougher than any other known paint and it is said will retain original color and gloss indefinitely.

Like glass

Eureka has launched a huge advertising campaign to pace the production of its home cleaning system and its cordless electric iron. This presages better deliveries of these appliances soon.

Desire building

Combining rollers and an electric lamp, a simple gadget called Roll-A-Ray, manufactured by O.A. Sutton Corp. is being marketed by Koehler-Briefer Associates through wholesale channels. It is designed to be used as a gentle massager that heats as it rolls.

Rolled heat

Graybar has a new sound-slide training film with which it is training your representative to treat you nicely when he calls to take your order. Shows that wholesalers expect to have to sell you their lines soon-- which means you will begin getting merchandise.

Back to selling

Emerson Radio has just announced a new dual-purpose radio receiver for the hard-of-hearing. Has a dual control so that while playing at normal volume for the home, the one with impaired hearing may listen at a plastic ear receiver which has its own volume control. Appearance will be that of a standard set, and will sell about $45

Hard hearing

Universal has reintroduced its floor polisher with certain improvements in finish and control, supporting the rolling brush and motor with felt wheels to prevent marring floor finish.

Polisher

Leonard division of Nash-Kelvinator has developed a pocket library of 18 little cartoon illustrated booklets with which to carry to dealer salesmen in local schools a selling story. Don Herold, famous cartoonist aided in the preparation of the set and has made them really enjoyable reading as well as instructive.

Selling is fun

Kelvinator, too, has a sales training program developed and ready for presentation to dealers by distribution branches. It ties in with the theme Kelvinator has stressed, that of attracting men to selling as a fine vocation, as expressed in a booklet, "To the man in search of his future."

Has a future

Remler Co. Ltd., of San Francisco, coincident with the announcement of its new portable "Scottie" radio, also announced the acquisition of a new and enlarged consolidated warehouse where, as agent for the War Assets Administration, it has electronic equipment and material. The warehouse is at 600 Beach St., whereas the company main office is at 2101 Bryant.

Radio surplus

Spring shows of the gift, toy and housewares fields will be held in San Francisco Civic Auditorium, Feb. 9-13; in Seattle at the Olympic, New Washington and Terminal Sales Building, Feb. 23-27, according to Kay Leber, show manager.

Gift shows

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ELECTRICAL WEST
Sales Guide

FOR THE ELECTRICAL MERCHANT OF THE WEST © November 1946

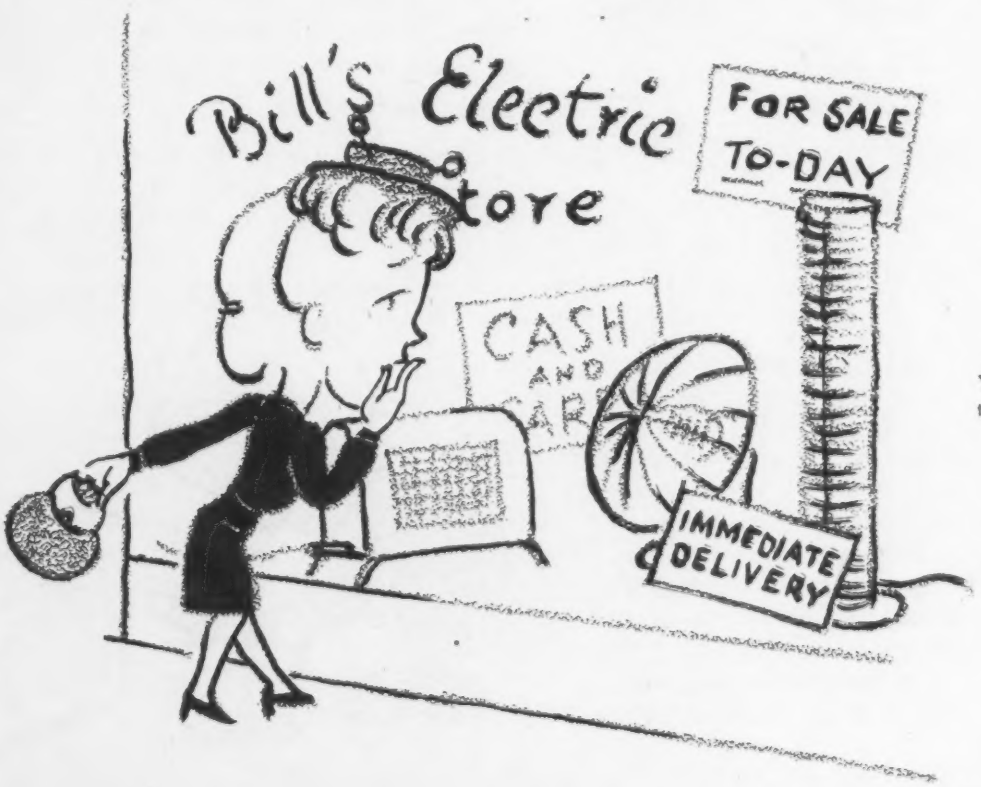
"Immediate Delivery" is Not Enough

PASS by a number of stores displaying electric space heaters today. There seem to be plenty on hand. But not one seems to use any sales appeal except "immediate delivery."

Now if every store has heaters to sell for immediate delivery and the public does not rush in and take them away, certainly it's time to use some other sales appeal, isn't it? Which is another way of saying that with plenty to sell it's a buyers' market—and they have to be **sold.**

It's been so long since the real sales appeals have had to be used that perhaps most of us have forgotten what they are. Another thing that makes many a merchant indifferent about labeling his heater diplay with sales appeals may be that he thinks it ought to be obvious to anybody what an electrc heater will do.

Yet it's a surprise to know how many people do **not** know— or do not **think** of the uses of an electric heater—and hence have no appetite to buy one. Their imaginations



Yes, they're available, but there's no reason to buy.

Tell People These Many Uses for An Electric Space Heater

BATHROOM

Quick warmth for shaving,
Adequate heat for the bath,
For drying towels,
Eliminating excessive moisture,
Heating shaving water,
Emergency heat day and night,
Drying hair,
Infrared ray treatments,
Baking facial packs,
Drying wave set on hair,
Baking out sore spots.

BEDROOM

Quick heat for dressing,
For maintaining warmth during sickness,
For comfort while using ultraviolet ray lamps.

NURSERY

Warming baby's clothes before dressing,
To warm baby's milk at night,
For vaporizing cold medicines,
To warm bedding,
Safe heat for children at play,
Heating room for baby's bath,
Drying baby's clothes.

KITCHEN, BREAKFAST ROOM

To remove the morning chill,
For drying clothes,
For raising bread,
For warming dishes,
To keep late comers' food warm,
For drying dish towels.

LIVING ROOM

Auxiliary to the furnace,
For piano practice when furnace is not operating,
To maintain the temperature after furnace is turned off,
For popping corn,
Toasting marshmallows.

GENERAL HOUSEHOLD USES

For damp laundries,
For drying wet shoes,
Thawing frozen pipes,
For the sewing room,
For drying out damp rooms,
To dry paint,
Additional heat for elderly people,
For vaporizing perfume water to sweeten the air,
Keeping pets at the proper temperature,
Guest rooms,
Dens,
Preventing mildew,
Warming poultices,
Drying photographic prints,
Removing gasoline odors,
Soften clay and wax,
Protect delicate plants,
Heat for attic rooms,
Relieving aching muscles,
For drying plaster,
For warming the workshop,
For drying pets after bathing,
For warming chilled feet,
To keep baby chicks warm,
In connection with repairing furniture and crockery,
Drying floor wax.

have to be stimulated. It evidently isn't obvious to them why they should have one or more.

Along the top of this page are listed just a few of the many things a portable electric heater can be used for in the home To be sure, there are too many to put on any one window card, or in any single ad perhaps. But selections can be made from the list to remind passers-by of some **personal** need an electric heater can fill.

The basic sales **appeal** or **advantages** of an electric heater are these:

Comfort—

Brings the cozy warmth of instant heat wherever used. Takes away the chill and the dread of getting up, bathing, reading or sewing in a cold room. Brings cheer from comfortable surroundings.

Health—

Helps prevent colds by keeping warm. Warms a person quickly when chilled and wet. Free from any fumes and does not vitiate the air. Useful for heat treatments and during illness.

Safety—

Children may play around it. No danger from upsetting. When cold weather requires closed rooms, its heat circulates the air, keeps it fresh and never takes oxygen from it. Provides a safe way to dry clothes or anything else.

Economy—

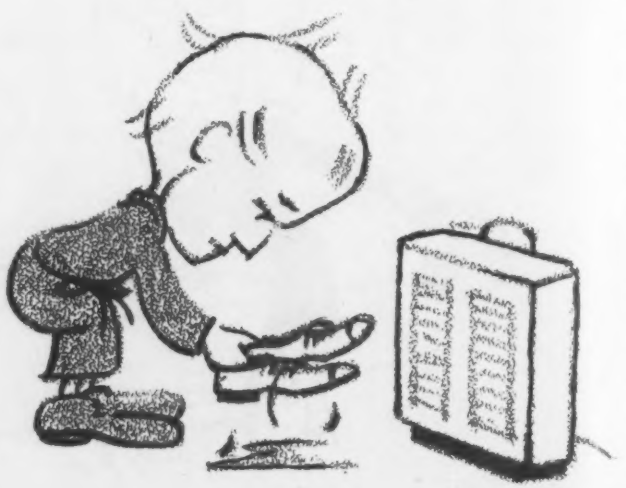
Heats without waste of fuel. Costs nothing to install, very little to buy, and operates on the lowest steps of the rate. Saves starting the furnace in spring and fall. Heats only localized space required at the time.

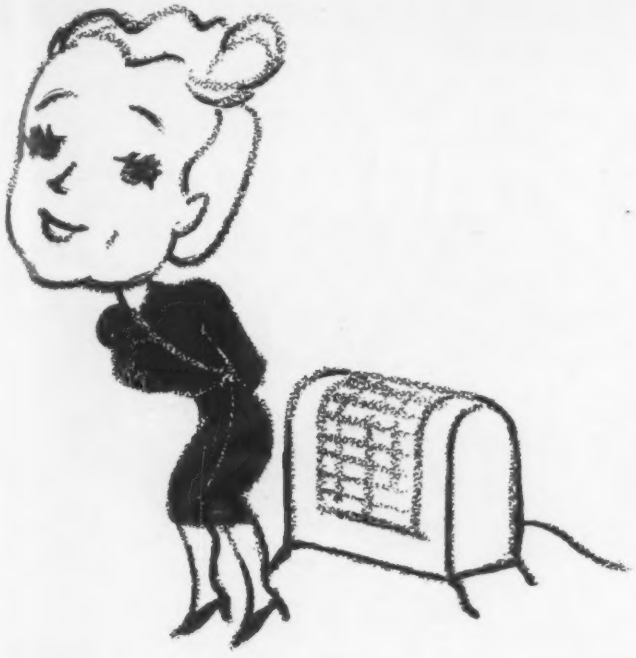
Convenience—

So easily carried from place to place, it has a hundred uses about home or office. (See list on this page.) Is independent of storage of fuel. Plug it in anywhere.

Endurance—

Simple and sturdy, it never wears out. Can be tucked away in summer, used whenever needed. Attractive in appear-





ance and long lasting in the everyday satisfaction it gives.

So instead of offering cut prices in order to move electric heaters, try some sales appeals instead. Write them into your ads. Put them on window cards or streamers. accentuate the ideas in window and store displays. Remind people that they can use one or more of them to advantage. Every home can use more than one.

With selling appeals you'll get **faster turnover, repeat business, full margin, satisfied customers, no service cost, low sales resistance,** and you can make heater sales a profitable line.

As the mercury goes down, bring out the electric heaters — and remind the public what they are for.

Heat Lamp Appeals to Use

Another item that is in good supply this winter is the heat lamp. Many lamp manufacturers make them and are doing a lot of national advertising on them. Attractive display pieces and cartons have been prepared to aid in selling them

With the oncoming of winter, the season to advertise and to sell them is here.

The appeals to use are similar to those which will create a desire for the portable electric heater. There are additional appeals and special uses that can be stressed.

For instance—

The heat lamp will do these things:

Ease pains from sprains or neuritis
Dry hair after a shampoo
Dry paint in a short time
Aid in scraping off old paint by scorching it if held close
Defrost a refrigerator unit quickly
Melt the grease in the kitchen drain
Dry small items of clothing—such as stockings, underwear, etc.
Dry dishes if directed at a stack of them
Dry nail polish quickly
Kill fleas on dogs and cats
Dry the dog or cat after a bath
Warm up a cold motor
Dry films and prints
Thaw out frozen pipes
Dry glue
Warm up chicken coops or kennels
Direct dry warmth over a bed for cold nights

Expense Control is Made to Please

Eleventh of a series of good sense articles on business management

By Ken Hampton

THE public likes to do business with a thrifty merchant, just as people respect a thrifty individual. For this reason it is often an asset to a business to let its customers know that it is careful in controlling its expenses. Lavishness does not necessarily denote quality any more than poor surroundings denote lack of character.

To **control** expenses the manager must **know what his expenses are,** which means he must have a bookkeeping record that will keep him informed in detail on his expenditures. It is not the purpose of these articles to discuss ways and means of keeping record books but this observation is in order that:

(1) like expenses should always find their way into the same account and be accumulated for periodic inspection and

(2) enough separate accounts should be carried to enable the manager to get a clear appraisal of the scope and relative importance of each group of expenses.

It is a truism that business success ties more closely to proper control of expenses than it does to sales promotion. This puts a responsibility upon the merchant to give a liberal part of his time to studying and controlling his expense expenditure.

It is hard to do this because it is the nuisance part of the business. The glamor all lies around the sales, advertising and display work but holding down expenses is a chore job and the person who does it is usually thought to be a grouch.

To avoid this, the necessity for expense control should be taught to all members of the organization. Part of the training given a new employee should be to build an awareness of the cost of operating the business and the necessity for keeping it at a minimum. Expense control should be planned and taught to the whole organization just as salesmanship is taught. The necessity for not wasting anything, e.g. thriftiness, should be taught first, along with cleanliness. For these two must go hand in hand if business is to be gained.

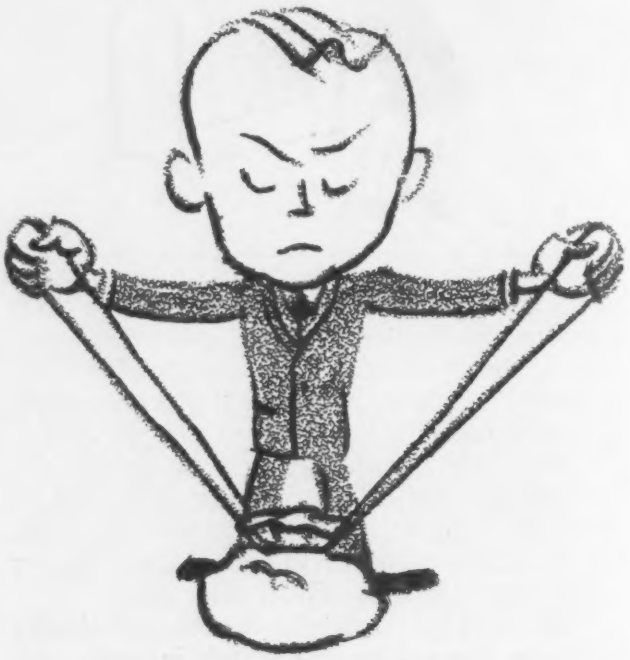
Next the organization should be taught to plan its activities to keep expenses down. Such things as taking all deliveries going in one direction on one trip and keeping "will call" packages in alphabetical order to save time are simple examples of a little common sense. However, one need only casually observe the operations of a few stores to see how seldom such simple things are done. This serves to point to the fact that such activities must be planned and taught to the organization.

In controlling expenses, the savings should be made so that they inconvenience the customer as little as possible. For example, customers know that delivering merchandise is expensive and will gladly wait for deliveries to be made on regular routes, if such necessity is explained to them as being a means of helping the store save so that it can sell goods at a lower price.

Explaining to a customer the necessity for delay or inconvenience is part of the salesman's job. He should thoroughly understand the necessity for keeping expenses under control and be part of the planning and operating unit that makes that control effective.

A definite part of any successful organization's time should be devoted to studying its expenses. This is a job for the managers and foremen as well as the office force which compiles the records.

The operation of the business should be continually reviewed from the expense as well as the sales viewpoint. In doing this it



All should help tighten up expense.

is well to look at the expense in groups. For instance all those having to do with sales and advertising may be considered in one group; those having to do with plant operation in another, overhead and management in another. Each individual account should be examined as well. By doing this and making comparisons with past records, the trends either toward too little expenditure or too much emphasis on one activity may be uncovered and corrected.

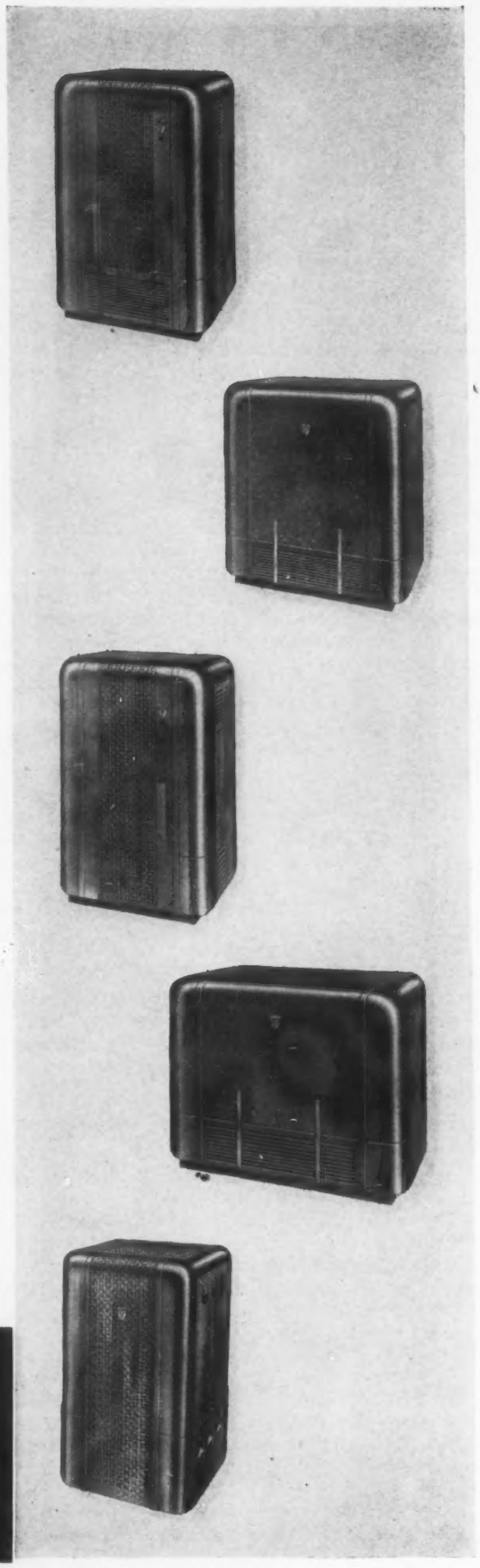
The purpose of business is to make a return on capital and effort for the owner in the form of a profit. Profit is only possible when expenses are less than income. The merchant must first keep records to tell him how well he is accomplishing this and secondly, use his records to help him and his organization plan and operate better. His success will be in almost direct ratio to the time and care he applies to this job.

ADVENTURES *in* GOOD HEATING

Designed by the pioneers in the oil burner industry, this complete, new Silent Sioux line embraces all the improvements, knowledge and engineering skills gained during the war years. New designs and improvements that mean greater comfort, safety, and convenience to your customers. Yes, to your customers Silent Sioux means adventures in good heating; to you, the dealer, it means new adventures in high volume sales. Beauty in design and efficiency in performance promise to make Silent Sioux one of the fastest selling lines in the oil burner field.

Shortages of sheet steel are still acute, production is slow but progressing, and delivery dates are still uncertain. However, complete illustrations and all specifications are available in our new portfolio, so write today and see for yourself the many advantages of the new Silent Sioux line.

SILENT SIOUX OIL BURNER CORPORATION, ORANGE CITY, IOWA



Silent Sioux

PIONEERS IN GOOD HEATING

"Give Us More Appliances to Sell!"

Northwest dealers haven't the heart to keep samples when they know their customers need appliances so desperately

FOOTBALL coaches send scouts to size up the plays and the strengths and weaknesses of opposing teams. The pioneers who crossed the plains depended upon scouts to blaze the trail for them. Big merchandising organizations have experts who study the markets and methods for use in their own strategy. It is the purpose of a magazine like this to serve those dealers who cannot send out scouts and to bring them information they can use; to be their scout.

One source of information is the Sales Guide News-Letter, now found in the heart of the section devoted to just such scouting reports. Observations of the editors who make trips serve in the same fashion. Travel these days is difficult and only a few places can be touched. However, from samples a general picture of conditions is built up—a picture that is relatively accurate at the time it was observed, for nothing stands still in these fast-moving days.

The Pacific Northwest was scouted quickly just recently and the situation among dealers can be generalized as follows:

There is almost no merchandise on display, less than that to be seen in California, where dealers strive to keep up appearances by retaining at least their samples. In the Northwest the dealers, perhaps more intimate with their customers, often say they do not have the heart to keep an appliance as a sample when they know someone needs it so badly. As a result, the stores on the whole look bare.

On the other hand, business has been brisk. Without realizing it many have sold more merchandise than they used to sell in their best prewar years. Sales expense is low, although service expense is high. The new appliances evidently are not inspected as carefully as they should be at the factory or are treated roughly in transit and require more service calls to satisfy the customer.

The feeling is strong in the Northwest, where range saturation is the highest in the country, that quotas of ranges have been set too low for that region.

Building activity is booming but hundreds of homes stand unfinished awaiting some materials or equipment. If the shortages should be remedied there will be thousands of new homes ready for appliances and no appliances to outfit them.

Utilities are loaded to the danger point in many areas and are even afraid they may have to ask for a stopping of sales until they can get transformers, copper wire, poles, meters, etc. to serve the new homes.

Specific comments in regard to some of the towns and cities follow:

Ukiah, California. Seems to be prospering from increased value of agriculture and the boom in lumber. Housing shortage. No new industries but infiltration of people from more congested centers. All electrical dealers doing well and seeking more merchandise. Presson Electric Co., R. A. Enight and Robert L. Becker Electric all had attractive stores, the latter built in the front of his residence just off the main business part of town.

Eureka, California. Lumber community. Actively booming because of the demand for lumber. Business moving away from the waterfront to new section of town. There are several new stores, such as Humboldt Appliance & Maintenance Co., owned by Ross Laurilliard, recently returned from the army, who opened a new store in the Redwood Theatre building. Only display was of pin-up lamps and a few new brands of small appliances. He moves out major appliances as fast as they come in.

Crescent City, California. Very small town but quite active due to lumber boom and harbor improvement program as well as exceptional tourist business this year. Carroll's Hedrick Electric Co., bare of merchandise but doing good business despite shortages. Does considerable wiring and had a display not usually seen in stores, a large table of wiring materials for retail sale. Said a good deal of such material was bought and installed by farmers. Difficulty in getting electricians from union headquarters at Medford restricts the volume of business that can be done in Crescent City. Hedrick Electric, was formerly a chain of three stores at Grants Pass, Oregon and Rogue River, Oregon. Carroll says they are separated and are gradually changing to names of the new owners, Hedrick having sold his interest to Carroll in Crescent City and to Fisher in Rogue River.

Nielson Electric & Hardware was originally an electric store but diversified during the war to hardware, when he moved around the corner from the main shopping district. Now he has started other businesses up that street, among them a new post office. Carries a large line of hardware and farm instruments and has very little electrical equipment on display.

Marshfield, Oregon. One of the most important coast towns in Oregon. Has grown rapidly during the war due to demand for lumber and because it was used as a port for shipping considerable supplies. Served by Mountain States Power Co., of which C. H. Coe is division manager. Coe declared that, like everywhere else, Marshfield has a big housing shortage and the scarcity of materials to build or remodel is matched by the power company's acute shortage of transformers, poles and even crossarms, in this timber country. The port was tied up because of the jurisdictional CIO-AFL fight over the manning of the ship. *Mello Franco.*

Marshfield Electric Co., old time concern, does industrial and commercial contracting chiefly. Has only a small display of appliances but expects to do more when the appliances are available. It is chiefly concerned now with serving customers in the sawmill and commercial businesses requiring motor repairs, etc.

Hanson Electric Co. had chiefly a display of lamps and lighting equipment and commercial and industrial lighting materials. Hanson recently bought out his partner. He is very ingenious in making up automatic devices for sawmills and tuna canneries.

Corvallis, Oregon. Stewart Appliance Co. is a very small shop but seems to do considerable business in repairs of appliances and carries a large stock of parts. Had signs up that he would be the Admiral dealer and carry several other lines when available.

Heckart's Hardware & Appliance, a large hardware store with a strong appliance department. Frigidaire dealer. Said they had been getting good delivery of refrigerators, which were

THE COMPLETE FACILITIES OF SYLVANIA ELECTRIC

are at your service—represented by the people of our PACIFIC COAST DIVISIONS

SAN FRANCISCO
Pacific Coast Sales Headquarters

GEORGE R. SOMMERS
Pacific Coast Sales Manager

Situated at strategic points in the Pacific area the people of these sales divisions offer the courtesy and service typical of Sylvania Electric Products Inc.

W. B. KENNEDY
Field Engineering Sales Service

LOS ANGELES
Division and Warehouse Headquarters

J. T. BURDICK
Division Manager

PHILIP A. CARLSTROEM
District Sales Representative

WILLIAM J. RASHLEIGH
District Sales Representative

JESS C. HICKS
District Sales Representative

THOMAS N. GILPIN
Service Manager, California

CARL S. LONG, Jr.
District Sales Representative

SEATTLE
Division and Warehouse Headquarters

C. A. DICKINSON
Division Manager

RAYMOND P. GUION
District Sales Representative

MARION A. HAMBERGER
Office Manager, Seattle

SYLVANIA ELECTRIC

MAKERS OF FLUORESCENT LAMPS, FIXTURES, WIRING DEVICES; ELECTRIC LIGHT BULBS; RADIO TUBES; CATHODE RAY TUBES; ELECTRONIC DEVICES

being delivered to customers as fast as received. They take deposits and have set up a list of customers entitled to the new merchandise as it comes in. Delivery of ranges has not been so good and there is considerable demand for them.

McMinnville, Oregon. Farnum Electric, one of the oldtime contractor-dealer organizations, has been doing considerable farm installation work. Merchandise situation similar to that in other towns.

Portland, Oregon. More detailed stories on the Northwest Appliance Retailers Assn. and on two or three important electrical dealers, will be run in a later issue.

Longview, Washington. Korten's big music store, which has also been a strong dealer in electrical appliances, badly crowded in old quarters is soon to move to a completely new modernistic three-story concrete building, three blocks away. Will occupy approximately half a block. Ted Korten specializes in the music department and Jack Rollings, former Hotpoint man, is his partner in charge of the appliance business. They have on their staff a full-time home economist, who puts on cooking demonstrations, schools, etc. More details will be published later of the features incorporated in the new store.

Port Angeles, Washington. City Electric Co., formerly operating the electric distribution in the city, which has recently been taken over by the city itself. City Electric Co. handles wiring, appliances, etc. Is also combined with Olympic Utilities Supply Corp., a wholesale organization. Through careful buying it seems to have amassed a good supply of lighting equipment and to have kept the flow of gas and electric appliances moving through the store. Wiring business has been exceptionally good; so has fixture business. Port Angeles has become important recently as a tourist center for those crossing to Vancouver Island. It has long been a lumbering town.

Seattle's big department store, Frederick & Nelson, does good business selling large refrigerated lockers and food freezers to its rural customers

Vancouver, B. C. Flooded with tourists. Very active in lumbering, manufacturing and shipping. B. C. Electric Co. enthusiastic about recent changes in their organization, wherein younger executives have been initiating many changes and new policies. The company was preparing an announcement to dealers that it would go out of merchandising completely. However, Howard Walters, manager of the commercial department, and John Taylor, dealer coordinator, have a number of unusual ideas for dealer assistance. A more detailed story on this will appear later.

B. C. Electric League has carried on consistently throughout the much longer English war and has a remarkable record of adequate wiring Red Seal installations. The wiring program is soon to be introduced on Vancouver Island and it is hoped that the hydro commission serving Nanaimo and several other communities will cooperate in the league. Red Seal is now advertised by home owners whenever they try to sell their houses, which indicates the general acceptance. Lately the league has been doing some 30 to 40 kitchen plans per week.

G. Langtry Bell, manager of the dealers' association, discussed the organization and its purpose and pointed out the nation-wide character of such work in Canada. Bell is director for British Columbia in the Canadian dealer organization.

Vancouver to Seattle. General observations — all the towns have grown considerably since last seen before the war. Considerable remodeling is going on, but more remarkable is the decentralization of business. Along all major highways stores are springing up. Most of the new electrical stores are on the outskirts of town in this fashion. Many new tracts are being opened and the land is being cleared as preparations are made to build houses for veterans. These give rise to new business districts, in which will

Harold Kelley
Portland

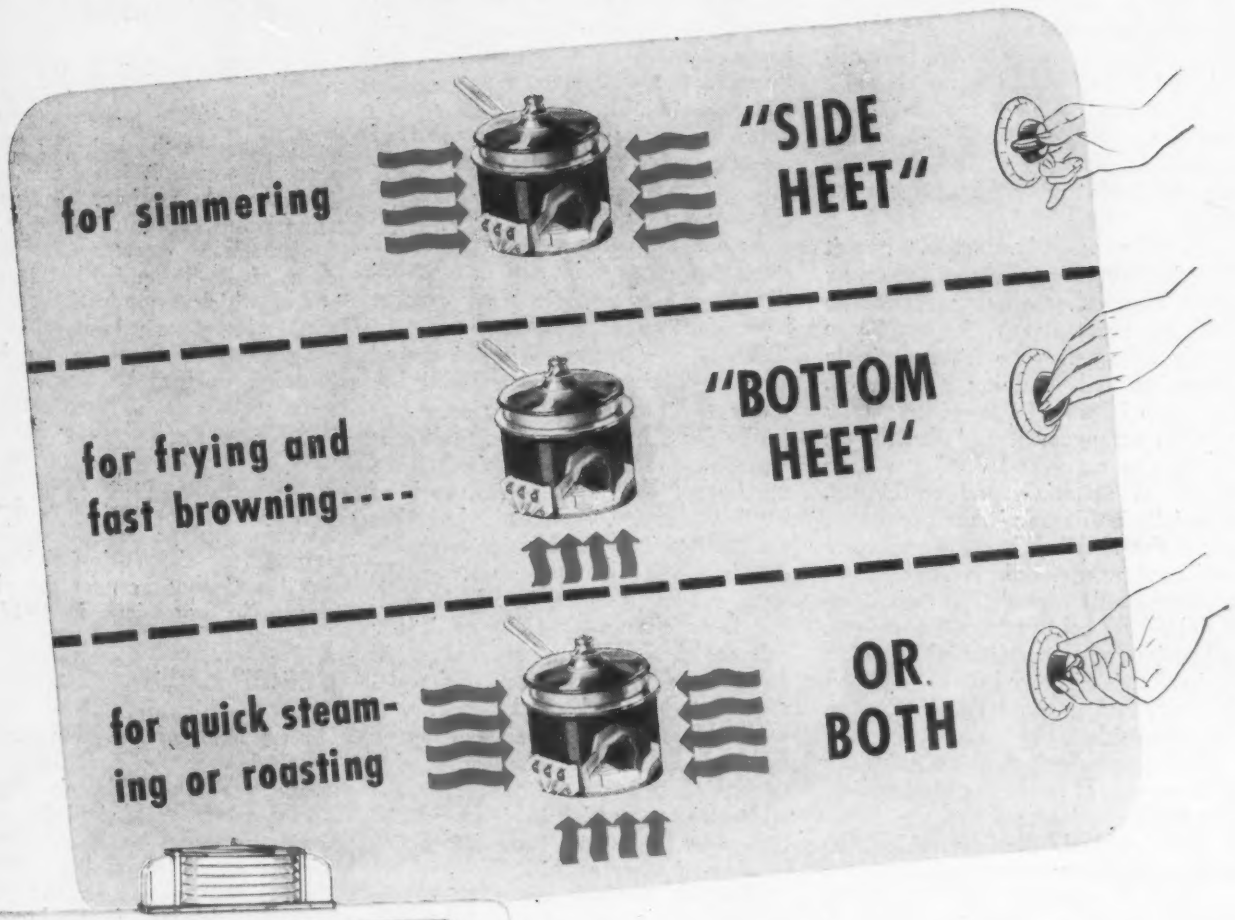
Maurice Leonard
Medford

Deo Palmer
Portland

Jack Rollings and
Elizabeth Boeckli

Arnold Kuhnhausen
Portland

Only MONARCH builds this "DEEP-HEET" Saucepan with . . .



"Deep-Heet" Saucepan is standard equipment on Monarch's famous Roaster Range.

This Monarch "Deep-Heet" Sauce Pan is another example of how Monarch's "50 years of cooking progress" is providing America's homemakers with *exclusive* cooking conveniences that mean easier and speedier preparation of meals . . . and in providing Monarch dealers with *exclusive* demonstration features that mean easier and more profitable electric range sales.

MALLEABLE IRON RANGE CO.
3916 Lake St. Beaver Dam, Wis.

RANGES AND HEATERS
Monarch - Paramount
COAL - WOOD ELECTRIC GAS and COMBINATION RANGES

be found many electrical and housewares stores, combinations of plumbing and electrical or hardware, or housewares and electrical. Where the cities are relatively close together, it won't be any time before there is no scenery along the highways. They will be completely lined with business houses, auto courts, taverns and signs.

Bellingham, Washington. Dealers in town itself not doing much remodeling and have very little merchandise to show. Department stores and furniture stores, which did considerable appliance business before the war, have not yet made up any appliance displays.

Mt. Vernon, Washington. Skagit Electric Co., owned for many years by Bruce Warrick, was bought in March 1945 by Lang Risley, Westinghouse Supply salesman, who is exceedingly aggressive and is doing a fine job. The shop is only 18 ft. wide, yet by compact arrangement and shelving he manages to carry and display a large supply of materials and equipment. Especially is this true in the back shop, where the shelving has been cleverly used to store material, wiring, etc. All tools are neatly racked. The front store is lighted by cold cathode fluorescent. Industrial and commercial lighting equipment is displayed on one side on shelving, and available appliances on the other side.

McDonnell Appliance, an old-timer in the center of town, has been run by Mrs McDonnell because of the illness of her husband. She diversified the stock with housewares and kept the excellent location in downtown Mt. Vernon, and thus maintained her contacts with all customers. As appliances come back into the picture, they will be emphasized again.

Ewing's Home Equipment Store, a plumbing shop originally, was putting in cold cathode lighting over the appliances section. Appliances were being placed on platforms. The store was still under construction but it was evident it would feature bathrooms, kitchens, laundry and major appliances.

Sears Roebuck was building a large new store.

Everett, Washington. Hellenthal's started putting in housewares some years before the war and is now a very complete housewares store. Well-rounded stock of all types of housewares, and places were being made again for appliances. Planned to have a model kitchen near the front, visible from the store windows.

Seattle, Washington. City Light Department has announced that it will continue the merchandising of electric ranges and water heaters. P. C. Spowart, electric sales manager, in answer to a protest from the Electrical Dealers' Assn., wrote all dealers in the city a detailed seven-page letter, setting forth the reasoning back of the department's direct merchandise sales policy. The letter told of the influence the department's merchandising had had upon the range saturation (63%) and hence the creation of a market for dealers; the development of electric water heating, likewise creating a market for dealers; the improvement of manufacturing standards; further creation of markets for dealers by subsidizing wiring and plumbing installation; and the necessity of meeting the stepped up gas competition. The entire letter was published in a recent issue of *Electrical Merchandising.*

Newest development being pioneered by City Light is a commercial hot water tank of 15-kw. maximum capacity for a hundred gallon tank. The tank is arranged with openings for a number of heating elements, each of 2½-kw. capacity. The required number are inserted upon installation to supply the draw-off demand from the apartment house or store in which it is installed. With a 100-gallon tank it is believed that the draw-off all day will not be sufficient to cause all the elements to come back on the peak.

City Light is also endeavoring to develop a simple electric heating rate, one which is as devoid of frills as the all-electric rate which it pioneered and that now has been adopted by a number of other utilities.

Mast's is a store converted from an appliance business of considerable volume with a sideline of sporting goods into a women's wear and sports shop during the war. Now with the return of merchandise the appliance department will be revived.

Bon Marche has installed a new appliance department facing the elevators on the fourth floor. The department is arranged so that all appliances on display can be demonstrated. The Plexiglas "dream suite" was being displayed and it incorporated a number of novel electrical features.

H. S. Poole, pioneer electrical dealer, was doing some remodeling. He is president of the dealer association.

Frederick & Nelson was making a feature of large walk-in refrigerators and freezers. It had sold ice cream cabinets converted to freezer units during the war and now handles the Beall walk-in refrigeration boxes in various sizes.

Other department stores and housewares stores were reviving their appliance departments. There seemed to be no new large-scale appliance stores in midtown but on all approaches to the city there were a number of new dealerships starting.

(Further impressions from the Northwest will be continued next issue.)

Show Postponed

San Diego's Electrical Show, once the climactic promotion of the Christmas season, will have to be deferred again because the building in Balboa Park in which it has been held will not be ready in time. This news was announced regretfully by J. Clark Chamberlain, secretary-manager, Bureau of Radio and Electrical Appliances, which organization had sponsored the electrical show in prewar years. The U. S. Navy has held the building during the war years as a part of the U. S. Naval Hospital at San Diego, and only now is turning it over to the city of San Diego again. Much work has to be done to put the building into shape for the show. Therefore, plans have been shifted to arrange for the Spring Fair in early April and thus resume the show sequence in San Diego in 1947.

Dealer Paper

First issue of the new publication for dealers in the San Diego County area, *Gas and Electric Appliance Dealer News,* published by the San Diego Gas & Electric Co., made its appearance in November. Edited by Murray S. Holloway Jr., the first issue is a tabloid-size, four-column, completely illustrated newspaper on glossy book paper, making liberal use of color and engravings. The illustrations show numerous San Diego County dealers' stores, and reproduced in miniature the advertisement which the Bureau of Radio and Electrical Appliances has scheduled to run in the newspapers of the county. Details of sales campaigns and other information of value to salesmen and dealers is carried, as well as messages from the utility company in regard to its dealer cooperative program.

● MATT MCENIRY, the Auto Equipment Co. of Denver, has volunteered as instructor for the basic sales training course to be operated in Denver territory jointly by the Public Service Co. of Colorado and the Rocky Mountain Electrical League. The National Electrical Wholesalers Assn. and Edison Electrical Institute basic training course is to be used. The first series of classes was scheduled to begin in mid-October.

Sales Provoking!

DOUBLE ACTION STORE WINDOW LIGHTING

All-Brite

PATENT PENDING

DUO-WINDOW-LITE

This new All-Brite fixture does a twofold merchandising job:

- Floods entire window with excellent lighting.
- Provides an illuminated panel for an advertising message. The translucent panel is easily changed for special announcements by removing two wing nuts.

The All-Brite Duo-Window-Lite is available for 4 20-watt and 4 40-watt tubes.

SOLD THROUGH RECOGNIZED JOBBERS ONLY

Approved by Underwriters Laboratories • Union Made

WRITE FOR CATALOG AND DISCOUNT SHEET

Manufactured by

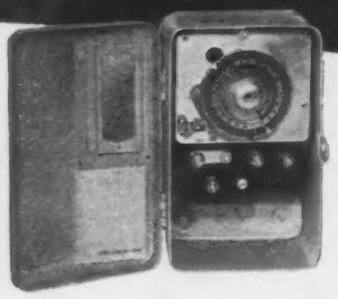
FLUORESCENT FIXTURES OF CALIFORNIA

2779 FOLSOM STREET
SAN FRANCISCO 10, CALIF.

All-Brite
TESTED AND APPROVED

Manufacturers of
"ALL-BRITE" Fixtures

How to
SELL MORE
Poultry
time switches



Stock the New Paragon **PS-30** *and "talk" these Unbeaten Features*

1 The new PS-30 provides . . . better than any other switch . . . both morning and evening poultry house lighting with dimming period for roosting. Lighting stimulates hormones, increasing egg production without increasing feed consumption . . . when egg prices are highest.

2 The PS-30 provides uniform work day throughout winter and summer . . . plus week-end leisure for owner and family group.

3 Telechron Motored. Lowest priced complete Poultry Time Switch . . $12.75 LIST

Write for sales aids. Paragon designs and manufactures Time Controls for every need.

PARAGON ELECTRIC COMPANY
1616 Twelfth Street, Two Rivers, Wisconsin

SALES REPRESENTATIVES

McCUNE-MERIFIELD COMPANY
2627 So. Figueroa Street . Los Angeles, California
51 Fremont Street San Francisco, California
72 Marion Street Seattle 4, Washington

Paragon Two Rivers WISCONSIN
BUILDERS OF ELECTRICAL EQUIPMENT SINCE 1905

APPLIANCES

and accessories

Range (1126)

The new model 8810C L&H electric range features balanced front, divided top, switches and controls on backguard. Surface units include a 2,100-watt, two 1,250-watt units, a 6-qt. cooker with inset pan and french fry basket. Oven contains a 5,000-watt Hi-broil Super unit, with equalized heat, Wilcolator oven temperature control, inner light. Range lamp with automatic time control operating both oven and appliance outlet or lamp with interval timer optional. Two service drawers provided.

Floor Polisher (1127)

A Universal floor polisher is available in limited quantities from Landers, Frary & Clark, who state that the unit is light weight but will do a thorough job. The motor is supported by a felt roller for greater ease in guiding and to prevent marring the floor. A tough bristle brush revolves on powdered metal bearings. The appliance is finished in baked blue crackle enamel and is constructed with a pressed steel frame and steel handles. A finger tip switch is located directly below a rubber pistol grip.

Automatic Brewer (1128)

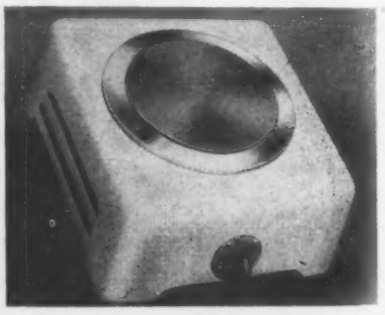
Cory Corp. has added a deluxe domestic automatic brewer to its line of coffee makers. The Cory Model DRU glass upper bowl is used in conjunction with a self-contained electric chrome serving decanter. Only moving part in the working mechanism, according to the manufacturer, is a thermostat which controls the high and low heat. The high heat is an enclosed, heavy-duty armored type unit; the low heat is a mica-insulated ribbon type element. High heat coil is brazed into the bottom of the decanter. This unit has 6-8 cup capacity; is for use with a-c.

Replacement Unit (1129)

A flat iron replacement element claimed to fit 90% of electric irons manufactured, is being offered by the St. Clair Electric Products Co. Heavy die-cut mica forms are wound with flat Chromel or Nichrome resistance wire for 600 watts on 110- to 120-volt a-c or d-c service. Mica protector sheets are machine-riveted to both sides of the heater coil subassembly. A 3¾x11/32-in. slot through the center permits easy alignment of the element with the frame and clamping screw, according to the announcement. Terminal leads are punched with four holes each to accomodate various sizes and types of receptacle mounts. Both leads are supplied with flexible asbestos or fiber glass loom which may be cut to the required length.

Hot Plate (1130)

Edwin L. Wiegand's new Chromalox hot plate, Type SHM, was designed for grills, diet kitchens, sandwich shops, soda fountains, etc. The frame is a one-piece, heavy-gage metal stamping finished in acid resisting white porcelain enamel. The plate is equipped with a Heatflo range unit with a flat solid surface; has three heat speeds. Available for 115 or 230 volts, it is 5⅛ in. high, 11¼ in. wide and 13⅝ in. deep, including switch knob.



ELECTRICAL WEST, 68 Post St., San Francisco 4, California
Please send me information about following CIRCLED items:

1126 1127 1128 1129 1130 1131 1132 1133
1134 1135 1136 1137 1138 1139 1140

Name ..... Company* ..... Title* .....

Address .....

* Please include your compapny's name and your position, as we cannot ask manufacturers to furnish literature unless you do.

Dual Control Radio (1131)

By means of a dual control arrangement, Emerson has provided a radio receiver which permits normal reception and at the same time allows greater volume for the hard-of-hearing. This set includes a standard speaker and a plug-in cord attachment with ear receiver and separate volume control. The hearing device is designed to attach to an audio circuit of the radio. Those with normal hearing can use the attachment for reception when others in the room do not wish to hear the program. A plastic earpiece is available, or hearing aid earpiece may be used, the announcement states.

Portable Radiators (1132)

The Morton CO-Z-Air line of portable electric radiators has been expanded to eight standard models. The new models include 800- and 1,320-watt units, in 5- and 8-section types. Elements are enclosed. These units may be plugged into any 110 to 120 volt a-c or d-c outlet, and deliver 2,600 and 4,300 B.t.u. respectively, according to the announcement. A new feature is a carrying handle which can serve as a drying rack when swung into horizontal position on either side of the radiator.

Water Softener (1133)

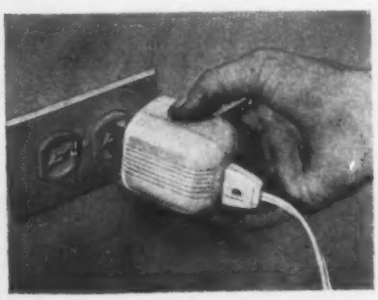
A semi-automatic domestic water softener, Model SA, has been announced by the Red Jacket Mfg. Co. The unit requires manual operation of two valves and otherwise is automatic, according to the manufacturer, who states that while the unit is regenerating, the softening material is washed, brined and rinsed without attention from the operator. A salt indicator pops up when salt is required and a soap test kit is furnished. These units are finished in white enamel with chrome trim and come in six sizes.

Heat, Massage Unit (1134)

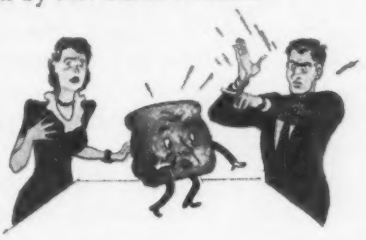
O. A. Sutton Corp., will make a combination heating and massage device called the Roll-a-Ray. This unit, which can be held in the hand while massaging or hung over a chair back for use as a heating element, contains an electric lamp fitted in a recess between two rollers. It is white with black handle and is supplied with electric cord.

Current Inverter (1135)

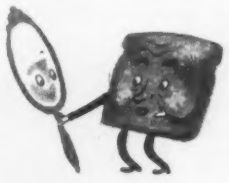
Electronic Specialty Co. is making a current inverter for use with electric shavers. Called the Ranger, this inverter changes household a-c current to d-c. The manufacturer claims that cutting efficiency on direct current is as much as 88% higher than when a shaver is operated on alternating current. This unit is of molded ivory plastic and is available in two models, one with, one without cord. Both models retail at $4.95, according to the manufacturer.



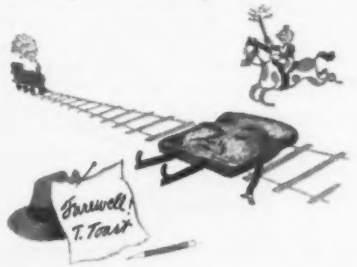
This sad fellow is Thomas Toast. Once he was a happy healthy piece of bread. "Tasty Tom" they called him. But like many others of his kind he was lured to ruin by Mr. Smith's toaster.



"Never darken my door again," cried Mr. Smith. "*I* wanted a golden delectable piece of toast and *you* are . . . ugh! . . . *burnt!*"



"Look at me," sighed Thomas. "All burned up! And so young, too!"



"No! No! Thomas . . . not that!" cried the Proctor Color Guard galloping up in the nick of time.

"You are not to blame, my boy," explained the Color Guard. "You were merely two-timed by an irresponsible, old-fashioned toaster that couldn't tell dry bread from moist bread. It could happen to *any* piece of toast . . . *except* in a new Proctor! That's where *I'm* on guard to see that every slice of bread gets to be a successful, perfectly-done piece of toast."

DEALERS!

PREVENT this tragedy . . . sell your customers a new Proctor 2-slice automatic pop-up Toaster with the Color Guard.

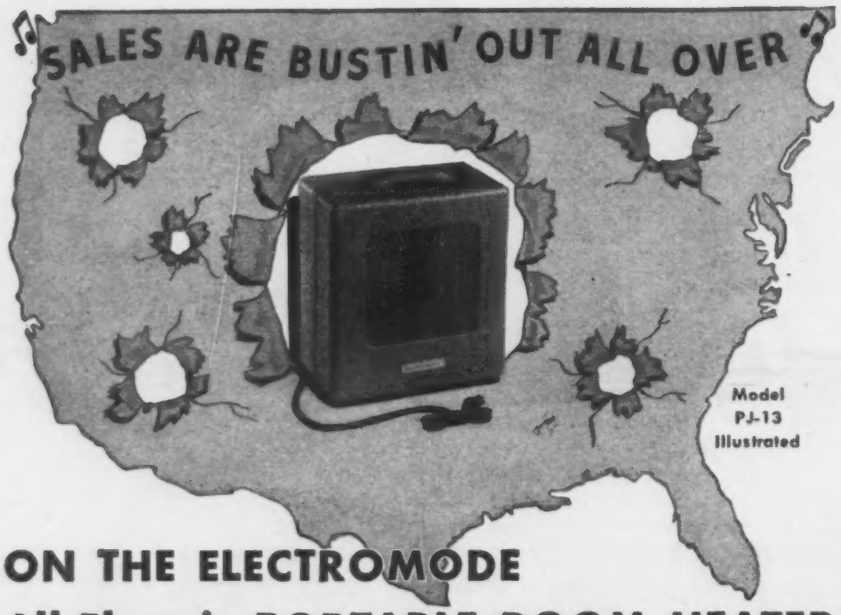
The Color Guard is a new kind of thermostat control, regulated by actual toast temperature. It automatically adjusts toasting for fresh and dry bread . . . even warms cold toast to peak toast temperature without burning.

For further information, watch for the Proctor Color Guard Booklet. Coming soon.

PRICE ONLY $16.30 OPA ceiling Fed. Excise Tax Included

PROCTOR *NEWSMAKER IN APPLIANCE MERCHANDISING*

PROCTOR ELECTRIC COMPANY, PHILADELPHIA 40, PENNSYLVANIA



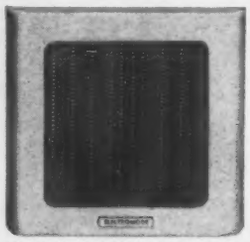
ON THE ELECTROMODE
All-Electric PORTABLE ROOM HEATER

ADVERTISING IN THESE NATIONAL MAGAZINES SELLS ELECTROMODE PORTABLE HEATERS FOR YOU

Number one on the heat parade is this all-electric portable room heater that has kept sales on the climb throughout the country. No wonder, too, when you consider what this "package of heating comfort" has to offer.

Attractively designed, the Electromode Portable furnishes clean, odorless, fan-circulated heat, with absolute protection against all hazards of fire, shock, or explosion. The exclusive Electromode Heating Element, same as used on U. S. Submarines, is enclosed in a one-piece finned aluminum casting which avoids the danger of exposed, glowing resistor wires.

Combine this effective product story with consistent national advertising backed up by cooperative sales promotion, and it's easy to understand why the Electromode Portable *heads up* the heat parade with profitable sales. Order now from your Electrical Wholesaler, or write ELECTROMODE CORPORATION, Rochester 3, New York.



Wall Model WJ-13 for bathroom, den, and other small rooms. Connects to regular home lighting service.

Approved by Underwriters' Laboratories

The Electromode All-Electric Home Heating Line includes Bilt-in-Wall Models in all required capacities for complete home heating—*electrically.*

ELECTROMODE
Portable ROOM HEATERS

WEST COAST FACTORY REPRESENTATIVES—RUSSELL AND COMPANY, 1355 Market Street, San Francisco 3, Calif.; HARRY F. HALDEMAN, INC., 1106 South Hope Street, Los Angeles 15, Calif.; FRED W. CARLSON, 307 Wall Street, Seattle 1, Wash.; JOHN W. LADLOW, P.O. Box 1784, Phoenix, Ariz.

Clock and Timer (1136)

The Chef, a combination electric kitchen clock and 60-minute timer introduced by G-E, is equipped with a buzzer which will sound off at the time set and continue ringing for about 20 minutes. Claimed to be accurate to the split second, this clock can be installed on the wall or on a work counter. It is just over five inches square. Clock face is tilted slightly for easier reading; numerals are black, clock hands storm blue, timer hand bright red. Plastic case comes in Chinese red, Nile green, ivory or white.

Minute Timer (1137)

Companion piece to the Universal Minute Savor pressure cooker is a Minute-Timer announced by Landers, Frary & Clark. This timer is 2½ in. in diameter with black bakelite case and base. It gives a ringing signal and is designed to time from one to 60 minutes by turning a dial to the time desired.

Table Radio (1138)

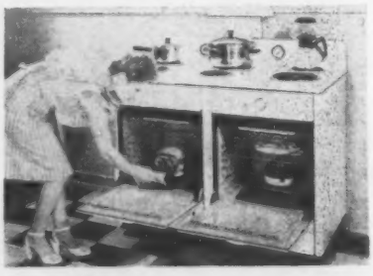
Olympic is making a table standard-shortwave model with a "TruBase" development built into the audio circuit, which is claimed to expand the audible range. This unit has 5 watts output, 5 tubes, phonograph connections.

Refrigerated Lockers (1139)

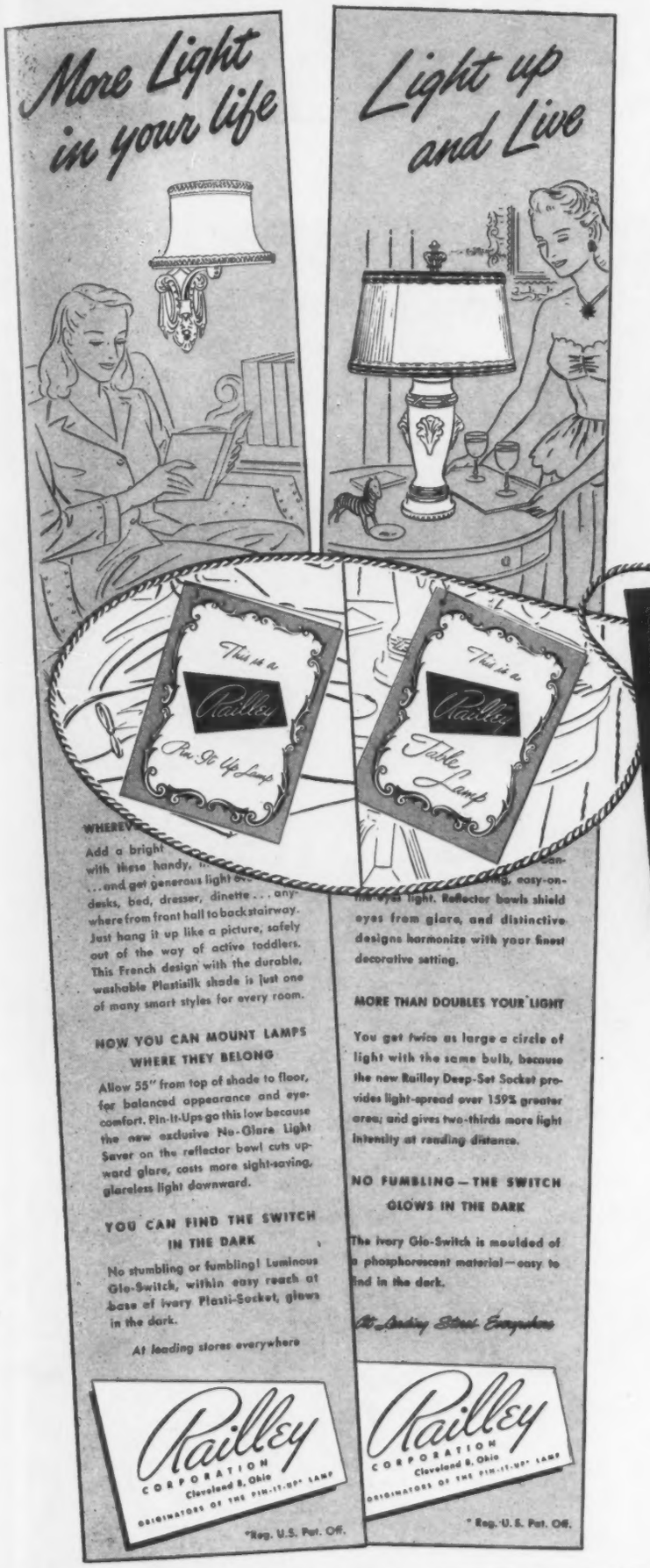
Iceberg Refrigerated Lockers feature separate refrigerated drawers, containing 6 cu-ft. of storage space and of the pull-out type. Locker units are installed in sections and additions can be made as required.

Two-Oven Range (1140)

Thermador has added a 2-oven, 6-surface-unit model to its range line. This range has two separate 18-in. ovens and two broilers; on the surface are three 2,200-watt and three 1,300-watt units. Each oven has its



own temperature control, temperature indicator and selector switch, oven light and racks. Range dimensions: cooking height, 36 in.; over-all height 49-in., floor area, 44¼x24 in.; top surface, 44¼x21 in.


More Light in your life
Light up and Live
This is a Railley Pin-It-Up Lamp
This is a Railley Table Lamp
WHEREVER
Add a bright
with these handy,
...and get generous light
desks, bed, dresser, dinette . . . anywhere from front hall to back stairway. Just hang it up like a picture, safely out of the way of active toddlers. This French design with the durable, washable Plastisilk shade is just one of many smart styles for every room.
NOW YOU CAN MOUNT LAMPS WHERE THEY BELONG
Allow 55" from top of shade to floor, for balanced appearance and eye-comfort. Pin-It-Ups go this low because the new exclusive No-Glare Light Saver on the reflector bowl cuts upward glare, casts more sight-saving, glareless light downward.
YOU CAN FIND THE SWITCH IN THE DARK
No stumbling or fumbling! Luminous Glo-Switch, within easy reach at base of ivory Plasti-Socket, glows in the dark.
At leading stores everywhere
easy-on-the-eyes light. Reflector bowls shield eyes from glare, and distinctive designs harmonize with your finest decorative setting.
MORE THAN DOUBLES YOUR LIGHT
You get twice as large a circle of light with the same bulb, because the new Railley Deep-Set Socket provides light-spread over 159% greater area; and gives two-thirds more light intensity at reading distance.
NO FUMBLING—THE SWITCH GLOWS IN THE DARK
The ivory Glo-Switch is moulded of a phosphorescent material—easy to find in the dark.
At Leading Stores Everywhere
Railley
CORPORATION
Cleveland 8, Ohio
ORIGINATORS OF THE PIN-IT-UP* LAMP
*Reg. U.S. Pat. Off.
Railley
CORPORATION
Cleveland 8, Ohio
ORIGINATORS OF THE PIN-IT-UP* LAMP
* Reg. U. S. Pat. Off.

Now every day will be "tag day" for Railley Lamps. Smart, newly-designed, informative four-page string tags on Railley Pin-It-Up* and Table Lamps will serve as a vital memory-link between the advertising your customers see in their favorite magazines and the actual Railley Lamps they see on your sales floor.

TAGGED

TO TIE RAILLEY ADVERTISING TO YOUR SELLING DISPLAY

Twelve leading women's magazines will carry Railley advertising, on a consistent, long-range basis to help build consumer recognition and make it easier for you to sell in the coming months when selling is not quite so easy as it is today. Consumers will become educated to look for the Railley tag . . . and they'll look for it in *your* store.

Railley
CORPORATION · CLEVELAND, OHIO
ORIGINATORS OF THE
PIN-IT-UP LAMP*
TRADE MARK REG. U. S. PAT. OFF.

RAILLEY CORPORATION • CLEVELAND 8, OHIO

USE THESE Westinghouse

The "know how" lighting series

FUNDAMENTALS OF THE FLUORESCENT LAMP

Written in simple language and using many diagrams, this 16-page booklet establishes the background necessary for understanding the efficiency and advantages of using fluorescent light. (Form A-4348)

HANDBOOK OF INFORMATION

This 24-page booklet explains how the incandescent lamp works; nomenclature for bulbs, bases, and finishes; characteristics of good lighting; and applications of the right light to various seeing tasks. (Form A-4438)

EFFECTIVE MERCHANDISING IDEAS

Tested techniques which help dealers sell more light are collected and illustrated in this 24-page booklet. Consistent, aggressive promotion of better merchandising sells better lighting and helps build the lighting load. (Form A-4715)

SALES-MAKING ADVANTAGES

Ten advantages of fluorescent light are nailed down in this 24-page booklet. These advantages are then translated into specific "user benefits" for each type of prospect—small shops, department stores, restaurants, offices, industrials, etc. (Form A-4720)

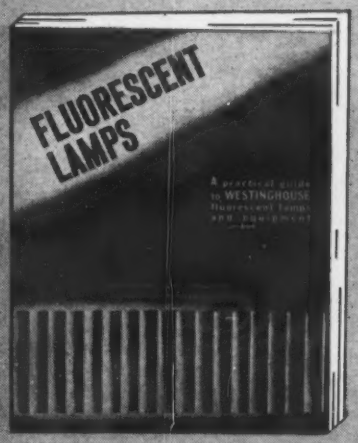
Westinghouse

Plants in 25 cities Offices everywhere

LAMPS FOR SEE-ABILITY

BOOKLETS TO SELL BETTER LIGHTING

The new practical guide to fluorescent lamps



DETAILED INFORMATION

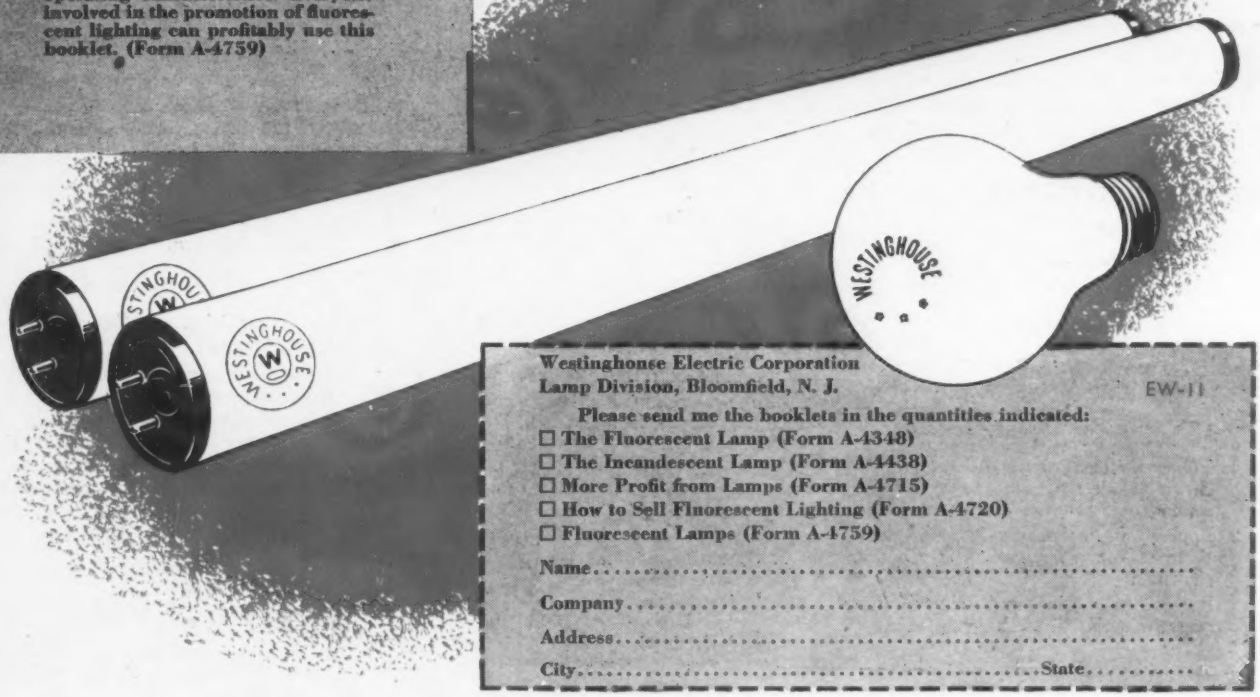
This 24-page booklet clearly presents all the data you need about Westinghouse fluorescent lamps and auxiliary equipment. It includes complete description of the lamps and equipment and gives details of operating characteristics. Everyone involved in the promotion of fluorescent lighting can profitably use this booklet. (Form A-4759)

If you don't already have this helpful literature, send for your copies now

Booklets like these help you sell lighting by explaining to your customers the characteristics, operation, and advantages of modern light sources.

Down-to-earth, simple, and profusely illustrated, they were designed for use by busy people interested in the proper application of light.

REASONABLE QUANTITIES FREE. We will be glad to send you reasonable quantities of any or all of these booklets for your use in promoting lighting sales. There is no charge for this material. Westinghouse Electric Corporation, Lamp Division, Bloomfield, N. J.



Westinghouse Electric Corporation
Lamp Division, Bloomfield, N. J. EW-11

Please send me the booklets in the quantities indicated:

- ☐ The Fluorescent Lamp (Form A-4348)
- ☐ The Incandescent Lamp (Form A-4438)
- ☐ More Profit from Lamps (Form A-4715)
- ☐ How to Sell Fluorescent Lighting (Form A-4720)
- ☐ Fluorescent Lamps (Form A-4759)

Name.....

Company.....

Address.....

City.....State.....

PCEA Panorama — Edited by A. X. Schilling

Conference Program

EVENTS planned for the PCEA Annual Fall Conference, scheduled for Dec. 5 and 6 in Fresno, have been planned to be of maximum interest and are expected to draw a record crowd. Accommodations have been engaged for 400 persons, and if you haven't made your reservation yet, the time is now. J. P. McElroy, hotel committee chairman, announces that doubling up will be necessary and that a roommate will be selected for those who have not made other arrangements.

Incidentally, if plans are changed, be sure to cancel reservations prior to three days before the conference; otherwise, the hotel will bill you for the space reserved for you even if you don't occupy it. Here's the line-up:

Thursday, Dec. 5, 9 a.m. to noon: General Assembly, Ballroom, Hotel Californian. M. G. Sanders, president, will preside, and the topic will be *Human Relations,* a program sponsored by the personnel committee, J. A. Long, chairman. The afternoon will be devoted to parallel section meetings.

Friday, Dec. 6, 9 a.m. to noon: Section meetings, continued. At noon, a general luncheon meeting in the Ballroom, Hotel Californian, with M. G. Sanders presiding. Luncheon speaker will be F. G. Larkin Jr., assistant vice-president and manager, Security-First National Bank of Los Angeles. His subject will be *Housing—Where Do We Go From Here?* The afternoon will be devoted to section meetings.

BUSINESS DEVELOPMENT SECTION

Hotel Californian

Chairman, K. L. Hampton
Vice-chairman, E. W. Morris

Thursday, Dec. 5

9 to 12—Participate in General Assembly.

12:15—Luncheon.

2 to 5—Section meetings, E. W. Meise, presiding.

1. *Big Business in Canned Gas,* J. P. McElroy, chairman, liquified petroleum committee.
2. Report of air heating and air conditioning committee, H. H. Douglas, chairman.
3. Report of agricultural electrification committee, E. G. Stahl, chairman.

Friday, Dec. 6

9 to 12—Section meetings, Room 212, Hotel Californian, J. S. C. Ross, presiding.

Report on electrical living committee, H. C. Rice, chairman.

1. *Have We a Mass Market Product?* V. W. Hartley, speaker.
2. *Modern electric kitchen committee,* B. M. Tassie, chairman.
   (a) Market.
   (b) Sales approach.
   (c) Financing.
   (d) Installation, planning, service.
   (e) Promotion, advertising.
3. *Some Light on Home Lighting,* L. A. Hobbs, chairman, home lighting committee.
4. *Subtle Selling—the Woman's Point of View,* Marguerite Fenner, chairman, home economics committee.
5. Home laundry committee, J. S. Fenton Jr., chairman.
   (a) Present home laundry situation.
   (b) Outlook for coming years.
   (c) Industry promotional plans.
6. *Adequate Wiring—the Basic Problem of the Electrical Industry,* Elbert Kramer, chairman, adequate wiring committee.

12:15—Luncheon, Room 212, Hotel Californian.

2 to 5—Section meetings, Room 212, Hotel Californian, S. W. Scott, presiding.

1. *Water and the Public Utilities,* V. C. Redman, PG and E.
2. *Store Modernization and Lighting,* E. E. Burke, Burke & Kober, industrial designers.
3. *Electrical Applications to Increase Industrial Efficiency,* R. A. Hopkins, Westinghouse.

OPERATING ECONOMICS SECTION

Hotel Fresno

Chairman, C. J. Nevitt
Vice-chairman, A. D. Bragg

Thursday, Dec. 5

9 to 12—Participate in General Assembly.

12:15—Luncheon.

2 to 5—Group meetings.

Transportation Group, Henna Room, Hotel Fresno, P. H. Ducker, sponsor.

1. Economics of further mechanization for overhead line construction equipment.
2. Segregation of public utility vehicles from other types of private carriers, as to classification.
3. Methods of taxing vehicles of public utilities.
4. Should commercial vehicles be further exempted from state, county or city regulations; if so, to what extent?

Hydro Generation and Substation Group, Crystal Room, Hotel Fresno, G. R. Woodman, sponsor.

1. Life determination of winding and rotating equipment and power transformers. Panel discussion: R. D. Likely, PG and E; J. H. Vivian, Edison.
2. Operating and maintenance experience with automatic and semi-automatic hydroelectric plants and substations. Panel discussion: Harold Sutcliff, PG and E; A. C. Warden, Edison.

Friday, Dec. 6

Meter Group, Jade Room, Hotel Fresno, W. M. Nott, sponsor.

1. Characteristics of polyphase watt-hour meters at very low power factor and high load. A. D. Irion, discussion leader.
2. Standardization of demand meter scales for recommendation to the National Meter Committee. G. A. Collins, discussion leader.
3. Changes and additions to meterman's handbook for recommendation to the National Meter Committee. R. G. Jones, discussion leader.
4. Sockets — load-carrying capacity and standardization. Frank Redding, discussion leader.
5. Methods of laboratory standardization of test meters, including allowance for temperature effects. W. N. Lindblad, discussion leader.
6. Service requirements for installation of sequence meters. E. B. Kipp, discussion leader.

Substation and Distribution Group, Crystal Room, Hotel Fresno.

9 to 12—

1. Installation, operation and maintenance of static capacitors. H. S. Lane and W. J. Walsh, discussion leaders.
2. Standardization of feeder regulation. Walter Smith and H. H. Minor, discussion leaders.
3. Operating and maintenance experience with hydrogen-cooled rotating machines. A. Jenkins, discussion leader.

9 to 12 — Tie-in control of interconnected power systems. J. W. Robinson, discussion leader.

2 to 5—*Transmission and Distribution Group,* Crystal Room, Hotel Fresno, T. A. Betterworth, sponsor.

(The Safety Group will participate in this meeting.)

1. Report in detail of insulator washer methods. J. A. Mulkey and G. L. Hill, discussion leaders.
2. Discussion of experience with low-cost secondary cable distribution, overhead and underground.
3. Transmission and distribution circuit reclosing.
4. Long-span joint construction in rural areas.

ADMINISTRATIVE SERVICES

Chairman, L. S. Heseman
Vice-chairman, George Henderson

Thursday, Dec. 5

9 to 12—Participate in General Assembly.

12:15—Luncheon.

2 to 5—*Customer Relations Group,* L. W. Brillhart, sponsor.

1. Improved customer relations through employee education. Eugene E. Whitworth, discussion leader.
2. Every employee a company representative. Charles H. Warner, discussion leader.

Friday, Dec. 6

9 to 12—*Customer Relations Group,* continued.

1. Training procedure for telephone service personnel. R. F. Ogborn, discussion leader.
2. Postwar service, what and when. E. C. Drew, H. C. Rice and Charles Davis, discussion leaders.

12:15—Luncheon.

I Bought MITCHELL

because it's the lighting that looks like a million. It's done wonders for my business. I've got plenty of the comfortable, glare-free lighting I need. The utility man who recommended MITCHELL certainly helped me make a smart investment.

I Recommend MITCHELL

because there's a MITCHELL Fixture that's right for any layout I plan. Figuring a job with MITCHELL lighting is downright easy. As a utility man, I haven't got an axe to grind, but I *know* good lighting. That's why I recommend MITCHELL.

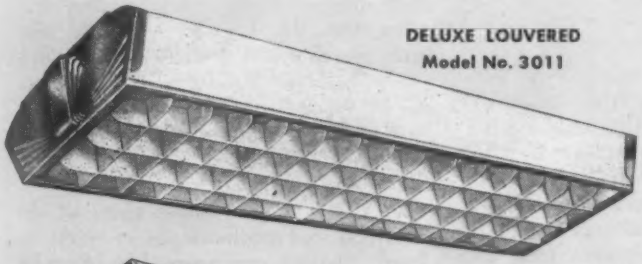
I Install MITCHELL

and it's a pleasure. Those fixtures are made right—to give top-notch service—*and* to hang with the least time and effort. Every MITCHELL job I do is a boost for me—brings me customers who want the same kind of efficient lighting.

I Sell MITCHELL

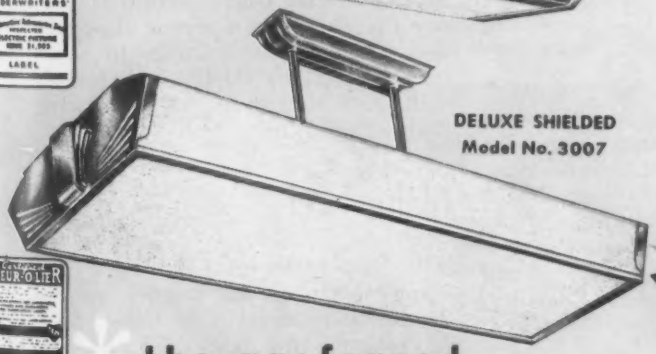
and of course you know why after hearing what the others have to say. As a distributor, I find selling the line is mostly a matter of keeping up with the demand. My lighting department concentrates on MITCHELL, the line that sells itself!

There's a Meeting of Minds on ..... MITCHELL



DELUXE LOUVERED
Model No. 3011

SHIELDED UNIT
Model No. 3004



DELUXE SHIELDED
Model No. 3007

USER, CONTRACTOR, UTILITY MAN, DISTRIBUTOR—each has his own reasons—good ones—for preferring MITCHELL Commercial Fluorescent Lighting. They add up to a "meeting of minds" on MITCHELL. The men who *sell* lighting, the men who *use* lighting are unanimous in their favorable opinion of this business-building, user-accepted line.

Mitchell Manufacturing Company
2525 CLYBOURN AVENUE, CHICAGO 14, ILLINOIS
Far West: *Complete Modern Plant and Sales Office at Los Angeles Serves the Entire Pacific Coast Area*
1019 NORTH MADISON AVENUE, LOS ANGELES 27, CALIFORNIA

MITCHELL

* the preferred COMMERCIAL LUMINAIRES

Makers of Commercial and Industrial Fluorescent Lighting Equipment Store Window Lighting • Spotlights and Floodlights • Desk Lamps • Portable Floor and Table Lamps • Bed Lamps • Ultraviolet and Infrared Health Lamps • Residential Lighting Specialties . . . Rad-i-Air Germicidal Units (made by Tru-Air Ultraviolet Products Co., Los Angeles.)

Discuss Ruling

Organized during the past year to deal with matters of state-wide importance, the California State Electrical Contractors Assn. held a special meeting at Fresno Hotel, Fresno, Oct. 5, under Tom Harris, chairman. Object of the meeting was to discuss the situation created by the California state supreme court ruling which had validated the Fresno ordinance, requiring examinations for contractors license. By thus validating the Fresno ordinance, all other similar ordinances were likewise effected.

C. M. Ozias, city attorney for Fresno, discussed the situation before the meeting of contractors representing all parts of California. He advised that legislative action should be taken to amend the state constitution at the next legislature and to place control of the issuance of licenses back in the hands of the municipalities. He declared this was justified on the basis of safety to persons and elimination of fire hazards.

Tabloid Convention

A tabloid version of the Illuminating Engineering Society's International Convention held recently at Quebec was to be presented to the three Pacific Coast Regional Conferences of the IES during the month of November, according to the tentative plans announced at the end of October. Besides the national president, Gilbert A. Hardacre, two of the prominent speakers on the Quebec convention program were to attend and present not only their own papers in digest form, but those of others affiliated with them. Arrangements have also been made for review of several other papers by Pacific Coast men.

D. W. Commery, General Electric Lamp Dept., Nela Park, Cleveland, was scheduled to present his own paper on *The Studies of Illumination Brightness in Residential Interiors* as well as the paper by Ward Harrison, regarding *Discomfort and Glare.*

William F. Rooney, Sylvania Electric Products Inc., Salem, Mass., was to present his own paper regarding the *Field Study of Factors Affecting Illumination Design*, and papers on *Color Harmony from Fluorescent Light Sources*, and *Light and Form.*

Fred J. Wellhouse, Westinghouse Electric Corp., San Francisco, was scheduled to present a paper by E. W. Beggs, of his company, regarding *New Developments in Mercury Lamps and Their Application.* Efforts were also being made to obtain the spectacular showing of the new flash tubes for photography as presented by S. E. Carlson, G-E Lamp Dept., Nela Park.

The Northwest Regional Conference at Seattle, Nov. 14 and 15, was also to have papers and discussion sessions by others from the surrounding region. At both the San Francisco conference, Nov. 18, and that in Los Angeles, Nov. 22, Dr. Leland H. Brown, Stanford University, was scheduled to review the various papers dealing with school lighting presented at the IES convention. Dr. K. Sampson, consultant Los Angeles, also will show to the Los Angeles group the uses of motion pictures in well-lighted classrooms.

Logan Tours

Harry L. Logan, manager of applied research of Holophane Co., has just completed the flying tour of the West, bringing to audiences of engineers, architects, lighting specialists and contractors, the results of his particular research work in the field of brightness ratios. With the title *Light for Living*, Logan compares the relative brightness of various objects and backgrounds in the natural settings, such as out of doors, and relates them to the brightness ratios that should be maintained for comfortable living indoors.

He spoke first to a meeting in Denver Oct. 15 at Phipps Auditorium arranged jointly by the Illuminating Engineering Society, Colorado Society of Engineers and American Institute of Architects. Next, he addressed a meeting of the Intermountain Electrical Assn., at Hotel Newhouse, Oct. 17, Salt Lake City. From there he went to Seattle for several meetings there with engineering groups, touched at San Francisco for a small meeting of the Illuminating Engineering Society, conflicting with the Electric Club on Oct. 21, then to Los Angeles and on to Texas.

Benefit Plan

The employees benefit agreement, cause of the controversy in the National Electrical Contractors Assn., was formally signed by both NECA and International Brotherhood of Electrical Workers officials, and was announced by Paul Geary at the IBEW convention in San Francisco. The formal signing was in the presence of Secretary of Labor Schwellenbach, who congratulated both groups on the plan as an important step in labor-management relations.

Signing for NECA were President Robert W. McChesney, E. C. Carlson, chairman of the Labor Relations Committee, and Paul M. Geary, executive vice-president. Signing for the IBEW were President Ed J. Brown, G. M. Bugniazet, international secretary, and C. F. Preller, member of the international executive council. The agreement was negotiated, then submitted to a referendum at the 44th annual meeting in Cleveland last October. Operation is contingent upon approval of all government agencies. This includes OPA, Wage Stabilization Board and Labor Department, as well as the Treasury Department. All agencies except the Treasury Department have given approval; its approval allows payments made by NECA members to be credited on income tax records.

The plan provides for a one per cent of labor pay roll assessment on all construction labor in the electrical contracting field which is to be paid into the union pension fund under a labor-management committee.

Joint Meeting

Two Sylvania executives from Salem, Mass., were the featured speakers at the October joint meeting of the Illuminating Engineering Society, Southern California Section, and the Electrical Maintenance Engineers Assn. of Southern California, in Los Angeles, Oct. 16. Charles Goddard, fixture merchandising manager of Sylvania Electric Products Inc., Salem, talked on *Fixture Maintenance.* Guy Morse, lamp merchandising manager of the same company, spoke on *Lamp Developments and Maintenance.*

In addition Ted Rand, chief of the electrical and mechanical section, U. S. Army district engineers Los Angeles office, gave a graphic description of the rehabilitation of Luzon, Philippine Islands, electrical system after the destruction wrought by war.

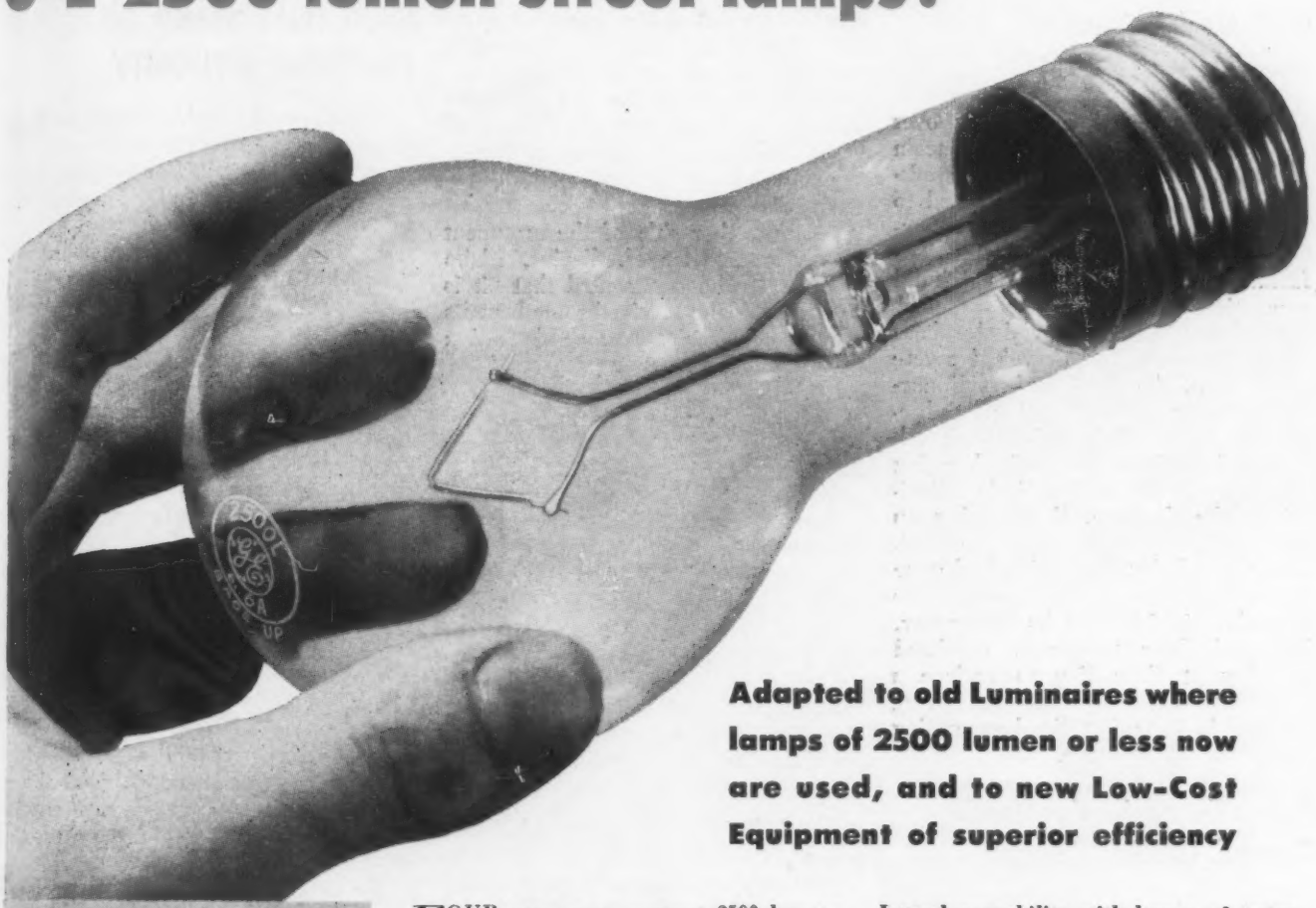
At the previous meeting of EMEA, Hugh C. Byrne, transportation supervisor Westinghouse Electric Corp., talked on *Development in Railroad Motive Power*, giving a review of present and potential developments in steam turbines, turbine electric, gas turbine and diesel electric, as well as electric locomotives.

Idaho IAEI

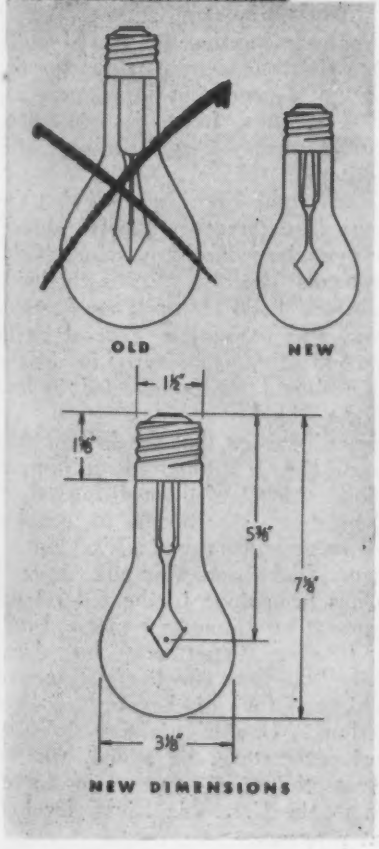
Idaho Chapter of IAEI came into being at the annual meeting of the Northwestern Section in Boise, Sept. 23, with the presentation of a charter at the opening session. Fred M. Varney, chief electrical inspector in Boise, is temporary chairman, and P. H. Forte of the Boise inspection department is secretary pro tem.

Other signers of the application for the charter were J. Carl Baldridge, Idaho Power Co., Boise, John W. Rosencrans, Idaho Power Co., Nampa, and Clyde Hecka.

Now you can standardize on the new G-E 2500 lumen street lamps!



Adapted to old Luminaires where lamps of 2500 lumen or less now are used, and to new Low-Cost Equipment of superior efficiency



FOUR new, more compact 2500 lumen street lamps are now available from General Electric, offering several important advantages:

Smaller lamp dimensions. Light center length reduced from 7″ to 5⅜″; over-all length from 9⅜″ to 7⅛″.

Improved, low-cost lighting. The new lamps have enabled manufacturers to develop luminaires that are smaller, less expensive, yet more effective in utilizing the light for safe seeing.

Interchangeability with lamps of lower rating. Greatly facilitate standardization. Can be used without socket adjustment in luminaires designed for 1000 lumen and smaller lamps.

Protection against arcing. They embody close-lead construction as an additional safeguard against service difficulties from arcing.

Available in current ratings of 6.6 and 7.5 amperes, and in standard 2000-hour and group replacement 3000-hour life ratings. For full details, call your nearby G-E lamp office.

NEWS of the industry

CITY MAY WITHDRAW FROM LINCOLN PUD

Following heated controversy over the acute power shortage in Lincoln County (Ore.) PUD territory, Reedsport city council last month voted to set up its own power plant. Presumably the city would buy existing PUD facilities or, failing that, would build competing lines.

Blackouts in Florence and elsewhere along the coast had provoked severe criticism of the PUD and of Bonneville Power Administration. Subsequently Bonneville's 115,000-volt Albany-Toledo line was energized, easing (but apparently not entirely alleviating) the shortage. Commenting on the situation, Administrator Paul J. Raver stated that Bonneville had gone beyond its normal responsibility to help the district meet its emergency, having built a temporary overhead crossing at Coos Bay to replace a damaged submarine cable and having assisted in installing diesel generating equipment at Florence.

Power Companies Can Handle Demand, Officials Contend

C. J. Strike, president of the Idaho Power Co., has dubbed the recent Interior Department order for the Bonneville Power Administration to start action in marketing federally generated electricity in southern Idaho (EWEST, October, p. 116) an attempt "to thwart President Truman's request for government agencies to curtail needless expenditures."

Frank H. Bird, president of the Montana Power Co., and George M. Gadsby, president of Utah Power & Light Co., joined with Strike to declare that there had been no shortage of power even during the peak loads of the war years in areas served by the privately owned companies in Utah, Idaho and Montana.

"These three private electric companies already have formulated plans for additional sources of power which contemplate the utilization of water in conjunction with reclamation projects for hydroelectric generation, and the operation of steam-electric generating stations to burn local coal," their statement said. The utility officials contended their companies are capable of meeting any foreseeable demand for electric power.

Strike claimed that "'in spite of the fact we are substantial contributors to federal, state and local taxes, our electric rates are among the lowest in the nation." He added that his company saw no need for the government to create further indebtedness by spending millions of dollars to "invade" Idaho with a tax-exempt power system.

On the other side of the argument was Senator Glen H. Taylor, Idaho Democrat, who commented that "it is high time Idaho received some benefits from the federal government's billion dollar Columbia power program."

Rocky Mountain Companies Report Name Changes

Power companies in the Rocky Mountain group have reported name changes. Trinidad Electric Transmission Railway & Gas Co., Trinidad, Colo., will be known in the future as the Frontier Power Co. Albuquerque (N. M.) Gas & Electric Co., with Federal Light & Traction Co. properties at Las Vegas, Deming and Sante Fe, will go under the name of Public Service Co. of New Mexico.

● FPC decision on merger of Northwestern Electric and Pacific Power & Light companies was not expected until after Nov. 1. Leading the opposition at the October hearing was Interstate Electric Inc., representing some 15 PUDs and arguing that strengthening of private power holdings would jeopardize PUD chances to buy out the properties. Others in the opposition were Washington and Oregon granges, the CIO labor council, Consumers Service Bureau. A Washington referendum petition asking a vote on the merger failed to qualify for the November ballot, obtaining only about 2,500 of the required 13,327 signatures.

● A PUD may borrow money by issuing a revenue note, Smith Troy, Washington state attorney general, advised State Auditor Cliff Yelle concerning the Clark County PUD of Vancouver, which had issued an electric revenue note for $75,000 payable to Ballard-Hasset Co. of Des Moines, Ia. Troy said the note in question is, for all practical purposes, the same as a bond.

● FPC has issued printed copies of its new General Rules, including new rules of practice and procedure effective Sept. 11, 1946. Copies are available at 25c each from the Federal Power Commission, Washington 25, D. C.

KRUG TELLS STAND ON COLUMBIA AUTHORITY

Secretary of Interior Julius A. Krug announced Oct. 12 that he favored "the idea, principle, and objectives of a regional Columbia Valley development body."

He thereby terminated speculation, which has prevailed since his appointment to the Interior post early this year, as to the future policies of his department in regard to TVA type river development—insofar, at least, as such projects have been suggested for the Pacific Northwest. However, his sponsorship of the valley authority plan for that area, asserted in a speech before the Public Ownership League of Washington at Seattle, included no hint as to his viewpoints on the development of other river basins.

Commenting upon the Columbia Valley Authority Bill presented during the last session of Congress by Senator Hugh Mitchell, Washington Democrat, Krug said:

"The idea of that bill was sound, the principles were right, the objective was not only desirable, but—in my opinion—essential to the rapid development of this region."

He took no stand on the details of the Mitchell Bill or any other CVA proposals, declaring that the provisions of such legislation were a matter for the Congress to work out in cooperation with legislators from the Columbia Basin area who were "familiar with local problems."

Krug emphasized his belief that the proposed regional authority should take over the federal government's developments dealing specifically with irrigation, flood control, navigation, power, and recreation. Federal agencies conducting other activities in the region should not be affected in any way, he added.

He pointed out that the federal government has spent hundreds of millions of dollars, most of them disbursed by the Interior Department, to develop land, water and power in Washington, Oregon, Idaho and Montana. A good job has been done in the federal development program, he contended, but the Interior Department has been seeking "the most effective government machinery for discharging federal functions." One of his first jobs as Interior secretary, he added, was to make a study along these lines in regard to the Columbia River development program.

SELLS TO BEAT THE BAND

Popular? **You bet! Why? Because Security is straight-tearing... non-ravelling...highly dielectric...has great tensile strength. Its strong rubbery adhesive *sticks* and *holds*.**

SERVING THROUGH SCIENCE

UNITED STATES RUBBER COMPANY

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The West's Outstanding Lighting Equipment
Users know from experience that the Smoot-Holman label is an assurance of quality. Look for it whenever you select lighting equipment, and be assured of outstanding service and trouble-free performance.
SMOOT-HOLMAN COMPANY
SMOOT-HOLMAN
INGLEWOOD, CALIFORNIA
MADE IN U.S.A.
Offices in Principal Western Cities—Branch and Warehouse in San Francisco

FPC SETS DATE FOR JURISDICTION HEARING

Jurisdiction of Montana Power Co. hydroelectric developments along the Missouri River will be determined in an FPC hearing to start Nov. 18 in Helena. The seven plants involved are located near Helena and Great Falls.

In 1943 FPC linked with the Missouri development the operation of Hebgen and Madison reservoirs (located on the Madison River above the plants) and stated that all should be licensed as a unit. The company had applied for license for the reservoirs but filed a withdrawal request in December 1943. It contends that none of the seven plants is located in a navigable section of the river and thus none requires FPC license; that the Hebgen reservoir is not subject to FPC jurisdiction since it is operated under a Department of Agriculture permit which antedates the Federal Water Power Act of 1920.

Arizona Power Rate Survey Goes Before County Court

Suit to have Arizona's proposed power rate survey declared unconstitutional has been filed in Maricopa County Superior Court by two Pinal County taxpayers. The survey, which has been under attack since it was authorized by the state legislature, was recently declared not subject to a referendum vote, in a state supreme court hearing (EWEST, August, p. 98).

It is charged in the taxpayers' suit that the legislative act directing the survey attempts to nullify the state corporation commission's right to make its own rate regulations and that it is an unconstitutional delegation of the state's power to a federal agency, in that it requires the commission to conform to FPC rules. A further charge is that the $50,000 appropriation for the survey is insufficient and that parts of the state would receive no benefit.

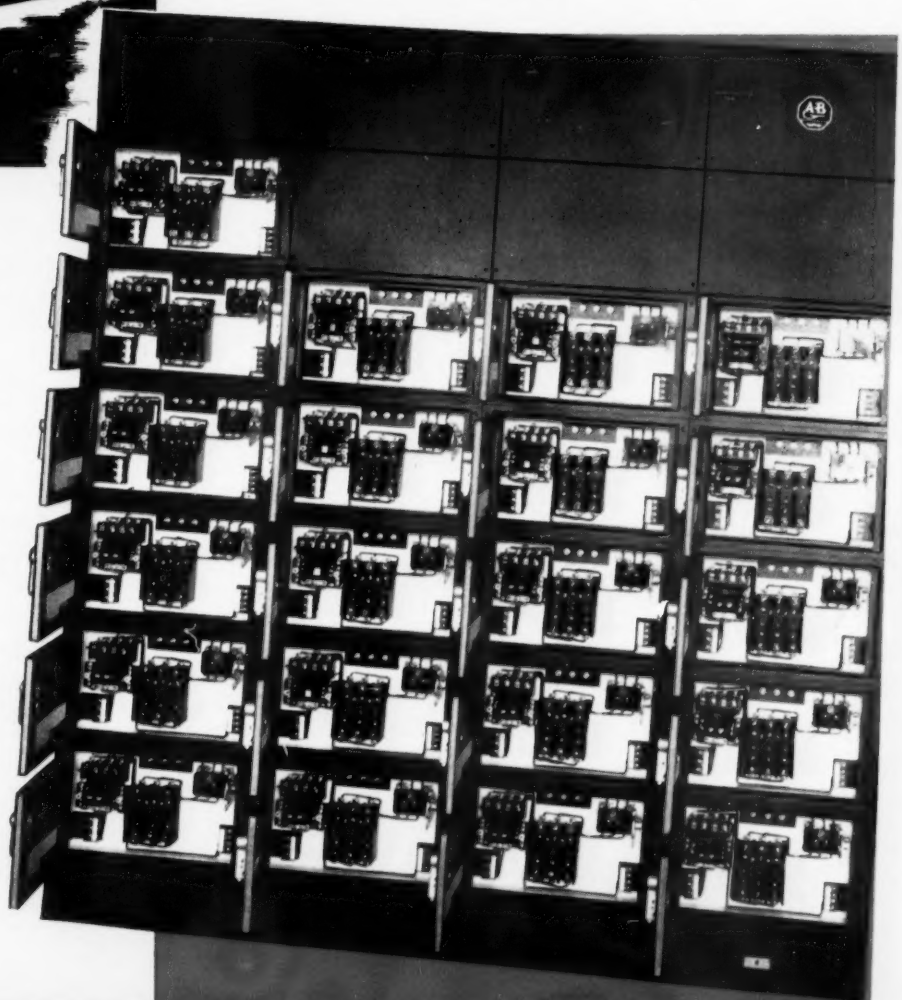
FPC Announces Approved Cost on PG and E Plants

FPC has announced approved cost of two Pacific Gas and Electric Co. hydroelectric plants, Potter Valley and El Dorado, at $11,336,362. A total of $556,974 of claimed cost was disallowed. Cost of the 12,500-hp. Potter Valley plant on the Eel River was set at $3,661,307; of the 28,000-hp. El Dorado plant on the South Fork of the American River, at $7,675,055. Both plants were constructed by predecessors of PG and E.

Modern Control Centers

Factory Built to your Exact Requirements

While the Allen-Bradley Multi-Unit Control Centers are custom built to your requirements, the individual control units are strictly catalog listed items. The job comes to you in a rugged self-supporting steel structure, all completely wired and tested—ready to install. You save installation time, eliminate installation delays, and are assured of a first-class professional job which is decidedly attractive in appearance. And the cost is usually less than the total cost of installing individual starters. Write for full information. Allen-Bradley Company, 1316 S. Second St., Milwaukee 4, Wis.



CENTRALIZED OPERATION

Motor control for a group of machines or for the entire plant is centralized in one point for convenient operation and inspection.

LOWER INSTALLATION COSTS

Special foundations or supporting structures are unnecessary. As all internal wiring is completed, the installation cost of the Multi-Unit Control Center is a fraction of the cost of installing individual units.

GREATER SAFETY

Buses and wiring are completely enclosed. Centralized location of all controls prevents tampering by unauthorized personnel. The Multi-Unit Control Center can usually be located away from dusty, corrosive or explosive atmospheres.

CLEAN MODERN APPEARANCE

Grouping starters in one convenient location saves space on individual machines, saves floor space in the plant, and provides a smart appearing job. Investigate Multi-Unit Control Centers—the modern method of installing motor control.

ADAPTABLE TO PLANT CHANGES

Multi-Unit Control Centers can be moved as a unit without changing the internal wiring, thus simplifying future changes in plant layout. Space can also be provided in the Control Center enclosure for future additions.

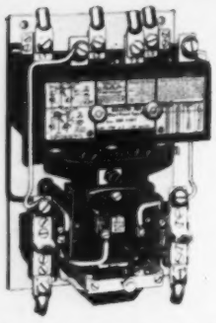
A-B Quality

ALLEN-BRADLEY

QUALITY

MULTI-UNIT CONTROL CENTERS

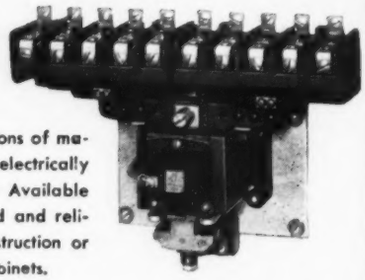
Trouble-Free
SOLENOID CONTROL UNITS
For Your Special Control Panels



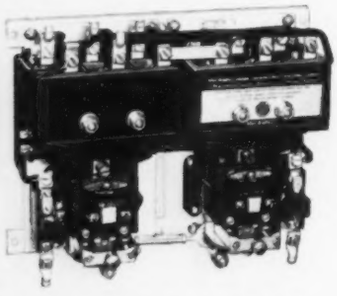
Bulletin 709 ACROSS-THE-LINE STARTERS

Designed for across-the-line starting of polyphase squirrel cage motors. Two thermal overload relays protect the motor from damage due to sustained overloads. Good for millions of trouble-free operations.

Bulletin 702 SOLENOID CONTACTORS



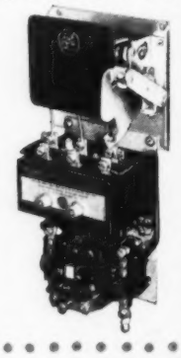
For controlling the various motions of machine tools and in all kinds of electrically operated mechanical equipment. Available in from one to ten poles. Rugged and reliable. Provided in the open construction or with several types of enclosing cabinets.



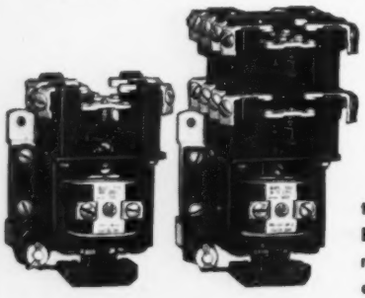
Bulletin 705 REVERSING SWITCHES

For automatically starting and reversing two- and three-phase squirrel cage and certain single-phase motors. Simple, reliable, mechanical contactor interlock.

Bulletin 712 DISCONNECT SWITCH TYPE COMBINATION STARTERS



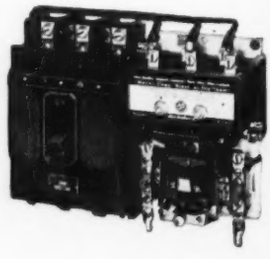
A manual disconnect switch also provided with silver alloy contacts and a solenoid type across-the-line starter mounted on a common base plate. These starters offer greater safety, require less space, and cost less to install than a separate starter and disconnect switch. Results in a more attractive job.



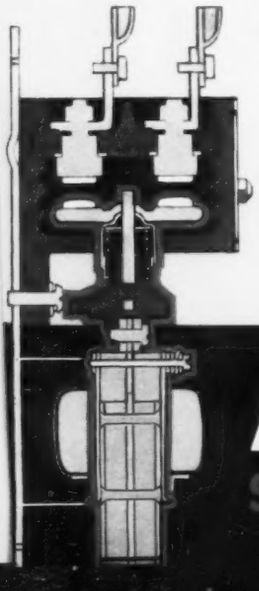
Bulletin 700 SOLENOID RELAYS

Small and inexpensive, but extremely rugged and trouble-free. Built with from one to 12 poles in many different types. Remarkably consistent in operating speed.

Bulletin 713 CIRCUIT BREAKER TYPE COMBINATION STARTERS



Consist of a solenoid type across-the-line starter and a magnetic trip ITE circuit breaker for short circuit protection. Furnished in the open construction or with several types of enclosures.

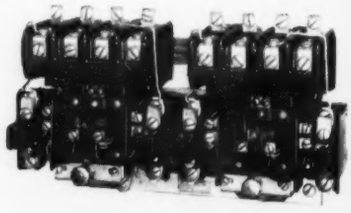


Only ONE MOVING PART in these Solenoid Starters

All of the controls listed on this page utilize the simple and trouble-free Allen-Bradley solenoid mechanism. They have no hinges, pivots, or bearings to cause variations in time of operation. All have double break, silver alloy contacts that require no maintenance. Write for information.

ALLEN-BRADLEY COMPANY
1316 S. Second St., Milwaukee 4, Wis.

Bulletin 715 MULTI-SPEED STARTERS



Designed for the remote control of 2, 3, and 4 speed squirrel cage motors of either the consequent pole or separate winding types. Consist of two or more magnetic contactors, each equipped with two thermal overload relays.

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL
QUALITY

A-B Quality

The Case of the INQUIRING LIGHTING SALES MANAGER

Chapter Two: HIS THIRST FOR KNOWLEDGE ABOUT CERTIFIED FLEUR-O-LIERS CONTINUES

In your last ad, you defined FLEUR-O-LIERS . . .

Yes — and briefly here's the story: FLEUR-O-LIERS are fluorescent lighting fixtures made to exacting specifications, set up by lighting experts, for performance, construction and service. They are tested, checked and *certified* as meeting those specifications by independent experts, Electrical Testing Laboratories, Inc., and identified by the ETL Certification Label, shown below.

Are all the individual "working parts" of FLEUR-O-LIER fixtures Certified?

Yes—which means *ballasts* and *starters.* Those "auxiliaries" are *Certified* as meeting rigid specifications applying specifically to that equipment. They, too, carry an ETL Certification mark.

How does all this help me?

The entire FLEUR-O-LIER Certification program means definite benefits and advantages to lighting manufacturers, sellers and users . . . because it assures top lighting performance, dependable operation and reliable, economical service from fixtures wearing the *Label.*

This Label is your clue to good lighting fixtures!

It is your definite assurance of *electrical, mechanical and lighting excellence* in fluorescent lighting fixtures!

FLEUR·O·LIER *Manufacturers*

Fleur-O-Lier is not the name of an individual manufacturer, but of a group of 27 leading fixture manufacturers. Participation in the FLEUR-O-LIER MANUFACTURERS' program is open to any manufacturer who complies with FLEUR-O-LIER requirements.

The New Home of

Lloyd

PRODUCTS

Lloyd appreciates the patience and forbearance you have shown when overloaded manufacturing facilities slowed down delivery of Lloyd Flex-Loc Lamp Holders and Lloyd Automatic Starters. We are now at home in this large modern plant, where greatly increased facilities will make possible greater service to all our customers . . . service which we hope will match in quality the matchless Flex-Loc Lamp Holders and Lloyd Automatic Starters.

LLOYD POLICY INSURES QUALITY

651-F
FLEX-LOC Lamp Holder

Automatically self-adjusting. Engineered to fit ALL STANDARD spacings. POSITIVE AUTOMATIC LOCK. PERFECT ELECTRICAL CONTACT. Brass contacts grip BOTH sides of lamp pins securely.

Listed and Approved by Underwriters' Lab., Inc., and Canadian Standards Assoc., App. Division E.T.L. Test Report 314454 Available

Patented—Other patents pending.

FS-40
AUTOMATIC Starter

CUTS OUT deactivated or flickering lamps. CUTS OUT current to lamp and ballast. Increases life of lamp and ballast.

Listed and Approved by Underwriters' Lab., Inc.

Certified by E.T.L., Spec. 6
Pat. Nos. 2200443-2228210

LLOYD PRODUCTS CO.

PROVIDENCE 5 RHODE ISLAND

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1534 Warren St., Denver

WILLIAM H. SANDERLIN, 129 First Ave., Seattle

UTILITY TELLS STAND IN JURISDICTIONAL DISPUTE

Following refusal of Central Arizona Light & Power Co. to permit the Federal Power Commission to examine its books, company officials explained that the action was a matter of jurisdiction and did not stem from a dispute with the state corporation commission or FPC.

"Because our business is conducted wholly within the confines of Arizona, we maintain that we are engaged in intrastate commerce and that the Arizona Corporation Commission has exclusive jurisdiction over our business or accounts," a statement in the *Spark Flame*, employee paper, said. "It is our contention that since FPC has jurisdiction over the business and accounts only of those power companies engaged in interstate operations, we do not come under its control. . . .

"When the FPC wrote to us and said they were coming to make an examination of our books, we did not think they had the right to do it. We did not want to be placed in the position of having a federal commission telling us to do one thing and a state commission telling us to do something else. Therefore, we told the federal commission that we were unwilling to permit such an examination.

"If it is lawfully established that the Federal Power Commission has jurisdiction over the Central Arizona Light & Power Co., this company will accord the FPC staff the identical privileges and cooperation in examining our accounts which we now extend to the Arizona Corporation Commission. We're sure that FPC understands why, until such time, we must maintain our closed door policy toward its examination."

Simmonds Appointment Opposed in Los Angeles

Opposition to appointment of George Simmonds, former union promoter, as a city commissioner in charge of the Department of Water & Power was voiced in Los Angeles last month.

Simmonds for many years was a salaried promoter of the AFL International Brotherhood of Electrical Workers, and is said to have encouraged the wartime strike against the city. To the opposition, Mayor Fletcher Bowron has stated that he does not believe that Simmonds was a top leader in the strike move and that he is needed to bring about better management-employee relations and to eliminate misunderstandings in the Department of Water & Power.

UTAH POWER COMPLETES REORGANIZATION PROGRAM

Election of a board of 12 directors on Oct. 16 completed Utah Power & Light Co.'s reorganization program. Announcement of the election was made by George R. Corey, vice-president and secretary, who attended the stockholders' meeting in Augusta, Maine.

Re-elected to the board were: E. G. Bennett, Ogden, and Fred M. Nye, George R. Corey, George M. Gadsby, J. A. Hale, Lafayette Hanschett, R. H. Jones, Malcom A. Keyser and Stephen L. Richards, all of Salt Lake City. Newly elected members are: H. A. Benning, Ogden, Fred A. Moreton, Salt Lake City, and Charles Redd, Lasal.

Other steps in the reorganization involved recapitalization of the company stock, eliminating all interest of Electric Power & Light Corp. and Electric Bond & Share Co. and placing control in the hands of preferred stockholders.

Contract Provides for BMP Industries

A Boulder Dam power contract for industries using the war-built Basic Magnesium Plant, near Las Vegas, Nev., last month was signed by Gov. Vail Pittman and State Engineer Alfred Merrit Smith of Nevada and was sent for signature to the War Assets Administration, Southern California Edison Co. and the Los Angeles Department of Water & Power.

Secured after a year of negotiation, the contract will make available upon demand up to 35,000 kw. of Boulder power to any industry using BMP facilities. (Demands other than those of BMP concerns must be met under the state's 18% share of the power.) The contract runs for five years and provides a rate slightly above three mills.

● CELEBRATING ten years of power production at Boulder Dam, the Boulder Dam Decennial was held in Boulder City, Nev., on Oct. 23. Representatives of all power agencies and others interested in the plant attended. Highlight was the presentation to the peoples of the seven basin states, through their governors, of a plaque outlining benefits of the dam.

● BONNEVILLE Power Administration has released two more in its series of economic surveys for power markets in the Northwest. The reports deal with Ferry, Stevens and Pend Oreille counties in Washington and Linn County, Ore., and are available from BPA at Portland.

Simplex-ANHYDROPRENE WIRES AND CABLES

These advantages are your assurance of higher cable economy, greater cable performance.

Simplex-WIRES & CABLES

SIMPLEX WIRE & CABLE CO. 79 SIDNEY ST. CAMBRIDGE 39, MASS.

PG AND E LAUNCHES CONSTRUCTION PROGRAM

Pacific Gas and Electric Co. last month filed application with the California Railroad Commission for permission to sell $25,000,000 worth of first and refunding mortgage bonds. The new bonds, Series F, dated June 1, 1946 and maturing 1981, would carry a 2¾% coupon, lowest ever offered by the company.

The application followed announcement by the company of a $160,000,000 construction program, $40,000,000 to be spent this year and $60,000,000 annually in 1947 and 1948. The expansion would add 625,748 hp. to the system and bring total capacity to 3,109,636 hp. by the end of 1948.

PG and E has filed application with FPC for a license to improve and make additions to its plants on the Mokelumne River and tributory streams, construction cost being estimated at $31,330,000.

Plans call for a 260-ft. main dam and 45-ft. auxiliary across the Bear River, creating a reservoir with net capacity of 46,000 acre-ft. A 38,000-hp. generating unit will be added in the existing Salt Springs power house.

At the West Point plant, the Tiger Creek afterbay will be diverted for use as a forebay and a 17,000-hp. turbine will be installed in a new power house. The present 26,810-hp. Electra plant, in operation since 1902, will be replaced with a 114,000-hp. installation. Additions will be made also to the Salt Spring Dam.

Other projects in the ultimate program include:

Pit No. 1 power house (Pit River)—improvement of regulating facilities to increase the peak load capacity by more than 42,000 hp., $940,000.

Potter Valley power house (Russian River)—increase the plant's peaking capacity by 5,630 hp. at a cost of $75,000.

Station P steam plant (Hunters Point, San Francisco)—two 134,000-hp. generators and associated equipment added to increase plant capacity to 330,000 hp., $24,582,000.

Kern steam plant (Bakersfield)—construction of 100,500-hp. steam-operated generating plant, $12,890,000.

Eureka Steam Plant—additional facilities at Station B, Eureka, to add 12,567 hp., $478,000.

Arizona Power Authority Tells Building Plans

A $30,000,000 construction program to provide facilities for transmitting Colorado River power to nearly all parts of Arizona has been announced by the Arizona Power Authority. The program will be financed through revenue bonds, according to Kenneth B. Aldrich, power authority director.

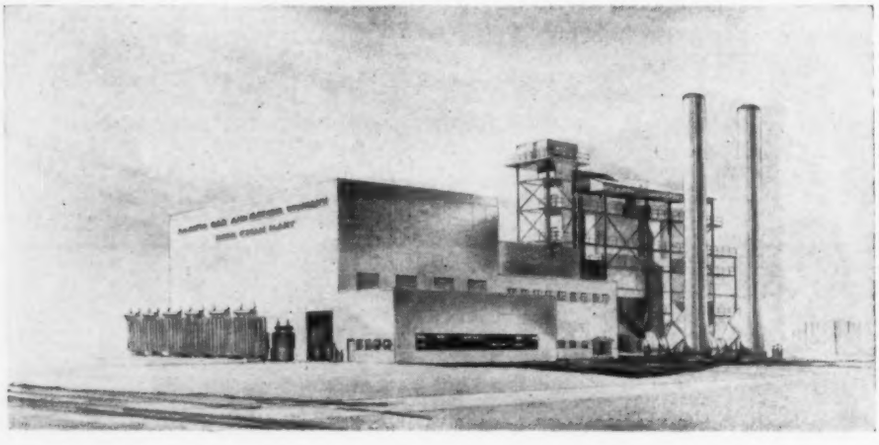
First step will be to build a line from Boulder Dam to Phoenix, with provisions for connections to Davis Dam when it is completed. This line will be routed between Ash Fork and Prescott to make power available to northern Arizona communities. Lines radiating from Phoenix to Tucson will supply the southwestern area.

Two steam generating plants, planned for an ultimate capacity of 15,000 to 20,000 kw. each, will be built, one near Phoenix, the other near Tucson.

In conformance with the Power Authority Act of 1944, the authority has solicited applications for power from cooperatives and other public bodies. Applications totaling some 830,000,000 kwh. are said to be on file.

Formal application has been made by the authority to the secretary of the interior for such amount of the power output from Davis Dam as may be made to the state.

Construction of Kern steam plant, a 100,500-hp unit at Bakersfield, Calif., is a part of PG and E's huge expansion program. The plant will cost $12,890,000



NORTHWESTERN ELECTRIC INSTALLS FM STATION

An FM radio station, one of the first in the area, has been installed by Northwestern Electric Co. on the top of Mt. Scott, 1,083-ft. butte east of Portland. Call number of the new station is KBPB.

When conversion of all present mobile radio equipment to FM is complete, the company will have approximately 40 cars and trucks equipped with two-way operation and another group of vehicles equipped with receiving sets only. According to company engineers, an advantage of the new system is that all vehicles can hear both sides of a conversation between dispatcher and any given car. Under the former system, the fixed station operated on one frequency, the mobile transmitters on another.

In tests before the station went on the air, the station's signal was heard over a radius of about 90 miles, according to W. Lee Campbell, communications engineer. With the new station, dispatchers have a clear channel at all times and calls can go on the air as soon as they are received.

● CITY OF LOS ANGELES has awarded Blaw-Knox Co. a $400,000 contract for piping to be used in its new power unit at the Harbor steam plant. This unit is a duplicate of the high-pressure installation made in 1941, for which Blaw-Knox furnished the piping. Boiler capacity will be 675,000 lb. per hour, the turbine will be rated at 65,000 kw. and the operating pressure will be 1,050 lb. at 915°F. Installation is scheduled to begin in early 1947.

● MORGAN, UTAH, has signed a ten-year power contract with Utah Power & Light Co. and will again distribute electricity over city-owned lines. Since generators at the municipal plant were burned out, nearly a year ago, the city has been served by the company. Under the contract, cost of power is reportedly 18% less than it was under the old municipal system.

● A $72,177 CONTRACT for 38,500 high-voltage power line insulators for the Oroville-Sacramento section of the Shasta Dam line was awarded by USBR to the Hendrie and Bolthoff Mfg. and Supply Co. of Denver.

● TWO SHASTA generators sent to Grand Coulee for wartime use will be returned shortly. General Electric has received a $181,080 contract award for installing the two 75,000-kw. units at the Shasta power plant.

Wire ahead

Because of the basic importance of adequate wiring to the entire electrical industry, Anaconda is presenting messages like this in a wide list of national publications

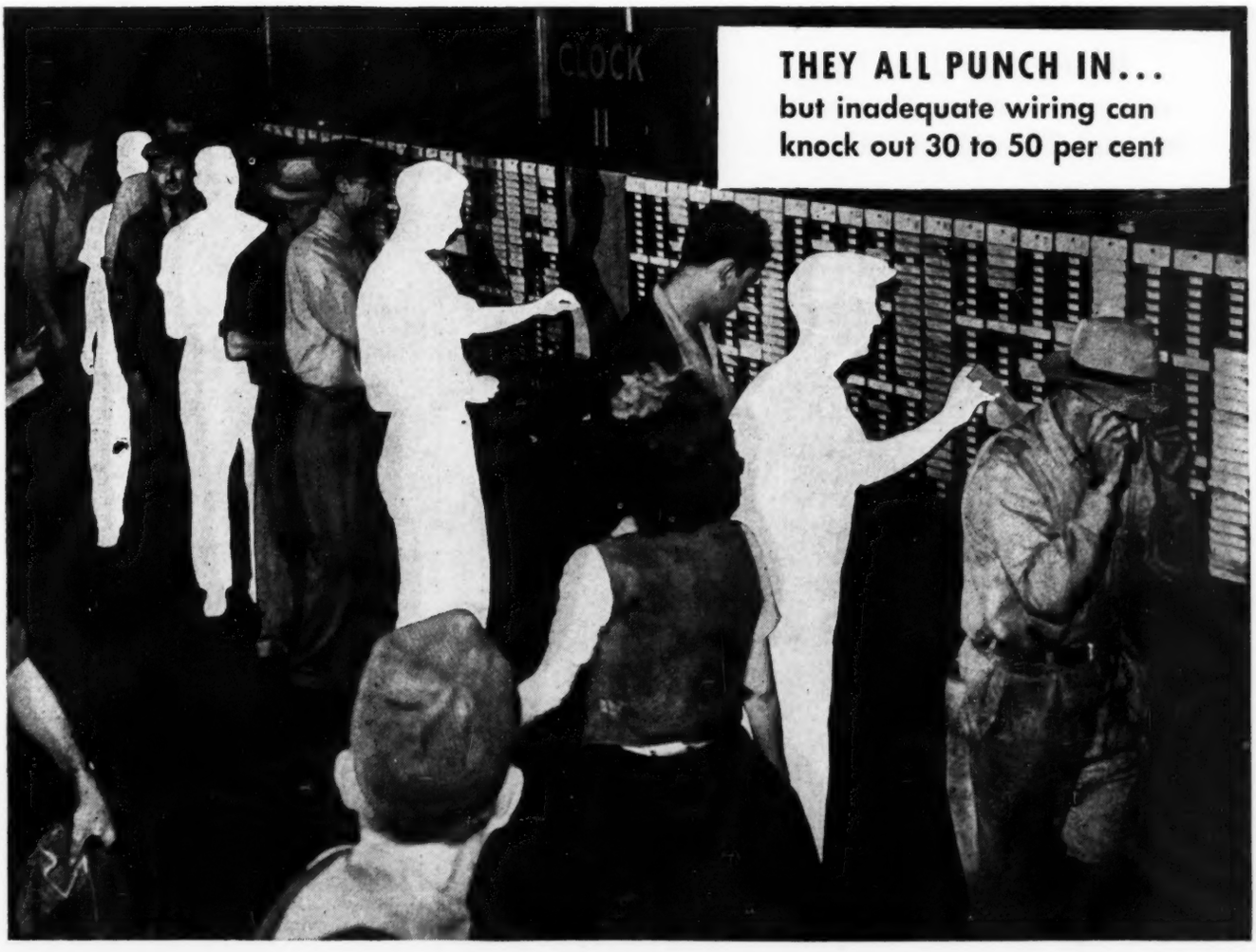
No matter how good a man is, he can't work *ahead* of his machine. And all too frequently overtaxed, over extended, obsolete wiring chokes off low-cost electricity from an efficient operator.

Is your plant safe against this threat to production and morale?

Why not check with your plant power engineer, your consulting engineer, electrical contractor or power salesman? It may save costly shut-downs and expensive alterations later.

Today, more than ever before, full production depends on adequate wiring. 46318

FOR FULL PRODUCTION



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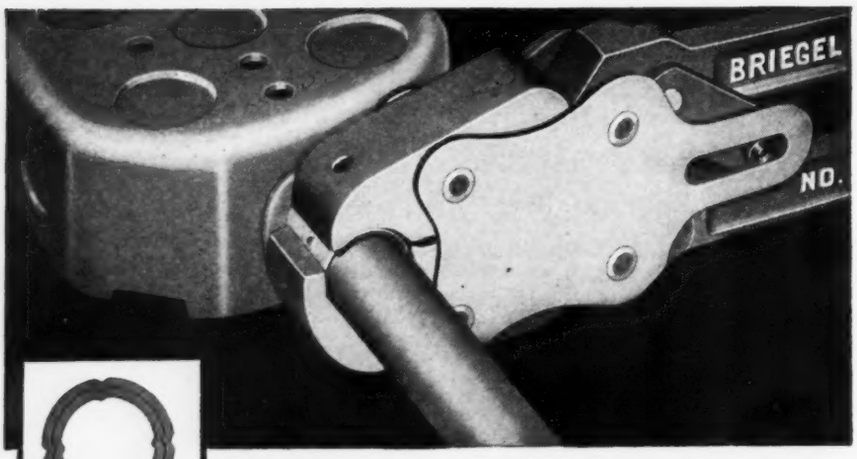

Cross section Showing Indentations.

E·M·T·UP THE QUICK WAY
Two Squeezes and it's Set

TWO QUICK SQUEEZES give you Finer, Faster Conduit Connections. B-M Fittings do away with the twisting, turning and tightening of nuts and save you valuable time and materials. Then too, they are stronger, neater and much easier to work with in tight places. Start using B-M Fittings today. Have more satisfied customers—more profits from each job!

(All B-M Fittings carry the Underwriters Seal of Approval)

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BM BRIEGEL METHOD TOOL CO. • Galva, Ill.

RELIANCE AUTOMATIC TIME SWITCHES

Model "W"

Completely automatic . . . extremely simple, compact, economical . . . three types cover practically every requirement . . .

Astronomic Time Switch

• The Model "W" Astronomic types are particularly popular for advertising illumination. The "on" operation changes daily to correspond with local sunset time, eliminating the necessity of re-setting the dial as the days become longer or shorter.

AMERICA'S RELIABLE
24 hour-a-day GUARDIANS

RELIANCE Time Switches have proved their dependability. They give complete and reliable service under many varied conditions — a factor of paramount importance when constant good service is essential. Send for catalog and price sheets for complete details.

RELIANCE AUTOMATIC LIGHTING CO.
1907 MEAD STREET RACINE, WISCONSIN

VET HOUSING AMENDMENT MAY INCREASE PAPER WORK

Amendments to veterans housing program Order No. 1 by the Civilian Production Administration threatens an increase in the amount of paper work which electric utilities will have to go through for some types of system construction.

VHP-1 was amended to slash drastically the $15,000 general exemption accorded utility and several other types of industrial structures. Hereafter, any such building which has less than 10,000 sq. ft. of floor space will have only a $1,000 exemption, and application for authorization to construct buildings costing more than $1,000 but having less than 10,000 sq. ft. of space will have to be filed with CPA.

The amendment specifically exempts industrial and utility power houses, whether publicly or privately owned. Since the exemption does not include substations, CPA officials predicted that applications henceforth will have to be made for substation structures costing less than $15,000 but more than $1,000, and having less than 10,000 sq. ft. of space. They added that the new amendment would not be permitted to operate so as to imperil power supply in any area.

The restrictive amendments will not apply to work which was started and into which materials had actually been incorporated by Oct. 7, date of the amendment.

San Diego Liberalizes Construction Code

In an effort to speed the home-building program, San Diego's city council has amended its electrical and plumbing code to permit home owners to do their own electrical and plumbing installations.

Under the amendment, persons may make their own plumbing and electrical installations, provided they pass an examination, agree to do their own work, pay extra fees for any extra inspections necessary and apply for a permit not oftener than once in two years. The examination to be given is similar to the journeyman's examination required by the city at the present time and consists of a "true" or "false" form test.

As an additional move to aid home building in the area, the council amended its subdivision ordinance to permit promoters of new tracts to build homes before all utilities and street improvements are in, provided the promoters post a bond guaranteeing that the work ultimately will be done.

NON-METERED SERVICE AUTHORIZED IN ARIZONA

Because the shortage of electric and gas meters is causing long delays in utility service extensions, the Arizona Corporation Commission has authorized temporary non-metered service.

The emergency measure provides that, whenever a utility's supply of meters is inadequate for existing or new customers, the company may temporarily remove its meters from existing services or establish non-metered service for new installations. Consent of the customer is required, and consumption will be estimated from the best available data.

It was specified that no charge be made by the company for removal or reinstallation of meters or for necessary connections. A company may at any time install a meter and thereafter bill the customer under its regular schedules.

Street Lighting Plan Off Seattle Ballot

Seattle City Council has repealed an ordinance which would have placed a $3,500,000 street lighting proposal on the Nov. 5 election ballot.

The proposed bond issue was held by the state supreme court to be in violation of the states 40-mill tax limitation law. The council, previous to the high court decision, had voted to place the proposal on the ballot, even though legality might be questioned.

Mayor William F. Devin has recommended to the council that the proposition be submitted at the earliest opportunity, since it has been estimated by City Engineer C. L. Wartelle that the proposed street lighting improvements would save about 40 lives a year.

● SEATTLE BOARD OF EDUCATION has set aside one of the oldest and dingiest schools in the city for experiments with modern lighting. Reasoning is that what works well there should be suitable anywhere. Five types of lighting are being put to practical use in five rooms of the school. At the end of the test period, board members will decide which type to install in all Seattle public schools.

● TEST LIGHTING of Multnomah Falls on the Columbia River highway was demonstrated recently to Oregon and federal officials. Blue, green, amber and white lights, with bulb sizes ranging up to 1,000 watts, were used in the test. Lighting of the 850-ft. falls is still in the controversial stage.

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WITH THE New
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Renewable FUSE
YOU'RE ALWAYS RIGHT...YOU CAN'T ASSEMBLE IT WRONG!
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Quality WIRE • CORD SETS
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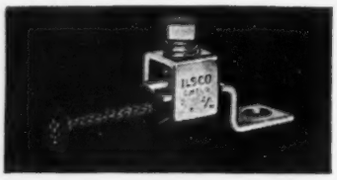
TROUBLE LIGHTS • CHRISTMAS LIGHTING SETS
ROYAL ELECTRIC CO., Inc., PAWTUCKET, R. I.



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PEOPLE

made this news

● EDWARD H. COE last month resigned as president of Central Arizona Light & Power Co. and Henry B. Sargent was elected to succeed him. Coe will be chairman of the board's executive committee and general consultant to the company. He has been in the utility field for more than 35 years and with Central Arizona for nearly 22 years, ten of them as president. He became temporarily inactive two years ago, due to illness, but returned to his office in September 1945 to assist in sale of the company and its transition to a home operated utility. Before his move to Phoenix, he was successively with General Electric Lamp Dept., the Niagara, Lockport and Ontario Power Co. at Buffalo, the Colorado Power Co. at Denver.

● HENRY B. SARGENT, who becomes president of Central Arizona, joined the company last March as executive vice-president. He had been connected previously with the Mississippi Power & Light Co., which he went with in 1927 following his graduation from Tulane University. When he resigned to accept the position at Phoenix, he was vice-president and general manager of the Mississippi company.

● ARTHUR D. BRAGG last month was made assistant Pacific district manager of G-E's apparatus department, with headquarters at San Francisco. He will retain his responsibilities as manager of the central station division, a post which he has held since April 1945.

● CHARLES H. WARNER has succeeded

Coe

Sargent

JAMES W. MAHONEY as San Francisco district auditor for General Electric Co. Mahoney, who retired on Oct. 1, had been with G-E at San Francisco for 40 years.

● ROBERT L. GILL JR., on Oct. 1, became Pacific Coast manager of the Bryant Electric Co., with headquarters in Los Angeles. He succeeds F. C. SCHARR, resigned.

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Fuses, Oilers, Clip Locks and Fuse Pullers

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Electrical Porcelain

For Positive Performance . . .
Ample Interrupting Capacity

Plus **Low Cost Protection**
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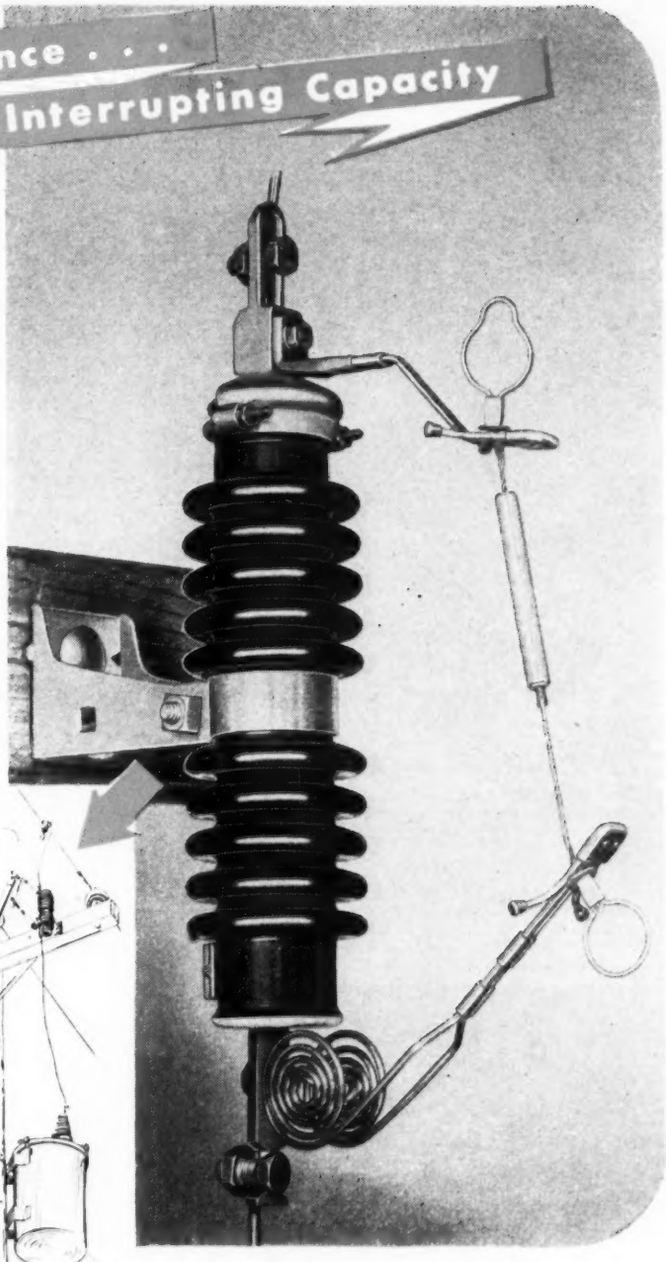
TRIP-O-LINK
Fuse Cutouts

These practical, dependable Kearney Trip-O-Link fuse cutouts provide the economical protection that is necessary on low revenue lines.

This original Kearney patented design—the single unit link and cartridge construction—provides a new arc extinguishing cartridge with each fuse link replacement.

To be assured of positive performance and ample interrupting capacity at low cost use Kearney Trip-O-Link fuse cutouts. Available in 50 and 100 ampere sizes, made in single shot and two shot reclosing types.



At left: Kearney Trip-O-Link Protects a 5000 Volt Rural Line

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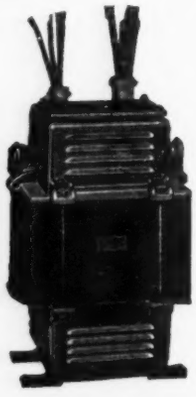

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Specify scattered transformers to eliminate duplicate conduit runs and save on power costs.

JEFFRIES TRANSFORMER COMPANY
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● IN A RECENT REORGANIZATION of the power operating division of Los Angeles Department of Water & Power, ROY MARTINDALE, assistant chief electrical engineer, has given up most of his duties as head of the operating division to assist Charles P. Garman, chief electrical engineer, in the power executive office. Martindale joined the department in 1911, following service with G-E and with the Washington Water Power Co.

● NEW HEAD of the Los Angeles department operating division is HARRY L. CALDWELL, who has been given the title of electrical engineer in charge of operation. IVAN L. BATEMAN has taken over the job of assistant electrical engineer in charge of operation. Other appointments recently effective: H. H. COX, engineer of overhead and underground distribution; BRADLEY COZZENS, engineer of transmission, trouble and communications; E. G. RUSSELL, distributing station engineer; JOHN RIEDER, superintendent of receiving and distributing stations; C. E. KODIL, in charge of research and records section; A. C. WINGO, engineer of generation; P. J. VOGEL, engineer of distributing stations and statistics.

● A. L. PERDUE has been appointed commercial and industrial sales manager for the Sacramento Municipal Utility District. He comes to his new post from the Oliver Iron and Steel Corp., where he held the position of northern California district representative. He served for 15 years with the Pacific Gas and Electric Co. San Jose division in various capacities, and in 1938 resigned to join Westinghouse Electric Supply Co. at San Francisco as lighting specialist. He served in the Marine Corps in World War I, and in the U. S. Navy, World War II, rising to rank of lieutenant commander in charge of a division of amphibious landing craft.

● APPOINTMENT OF WALKER H. LINDSAY as rural power supervisor for the Sacramento Utility District has been announced by Daniel K. Coyle, sales manager. Lindsay comes to the district from the Pacific Gas and Electric Co. Sacramento division, where he had wide experience in operating, sales and farm power advisory work. He managed his own dairy and grain farm for 12 years.

● CLARK PETTIT has been named advertising manager of the Sacramento Utility District. Pettit was formerly associated with the Knollin Advertising Agency, San Francisco. He served as lieutenant, Photo Intelligence, U. S. Navy, World War II.

Sloan

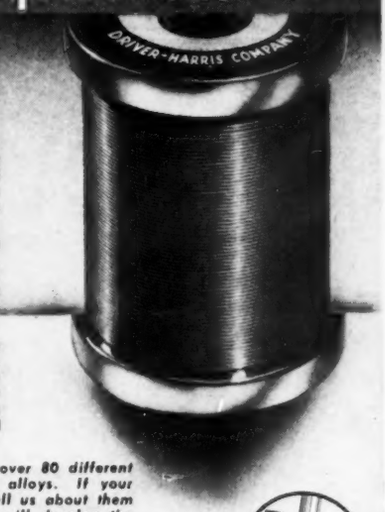
● ROBERT S. SLOAN, formerly appliance sales supervisor for Westinghouse Supply in Seattle, has been transferred to San Francisco as northern California district appliance manager. A native of Washington, he joined Westinghouse Electric in 1930, at East Pittsburgh and transferred to the West Coast in 1936, serving as appliance supervisor at San Francisco and Los Angeles, until he was transferred to Seattle in 1943. He went with the Supply company in 1945.

● R. D. CONSTABLE has been named Seattle branch appliance manager for Wesco, succeeding R. S. Sloan. Constable joined the Fobes Co. (later taken over by Westinghouse) at Seattle in 1923. During the war he was a chief electrician in the Navy, and upon discharge returned to Wesco's Seattle branch as appliance salesman.

● ROBERT M. NICHOLS JR., has been made Wesco's nothern California district sales promotion manager. He formerly was branch appliance promotion manager at Salt Lake City. He was in the Army from December 1940, until November 1945.

● WILLIAM B. DYKE, who stepped from lieutenant, jg, USNR, aboard the *Lansdowne*, to become a window trimmer in the art department of San Diego Gas & Electric Co., was named the new editor of the *News Meter*, monthly employee magazine of that company, succeeding DEL DICKSON. Dyke was associate editor of the English department's magazine in Indiana University, from which he was graduated with an AB degree. Dickson, who became editor three months ago upon the resignation of KATHRYN GATES FRAZER, was recently appointed city manager for National City, Calif.

there's a DRIVER-HARRIS ALLOY for Every Electrical Resistance Requirement



NICHROME* & NICHROME V for winding large value resistors where space factors call for compactness in design without sacrificing dependability. Available in all shapes and sizes drawn down to the extremely fine gauge of .001" diameter—67 miles to the pound.

Also the time-tested standard alloys for all vitreous enamel resistor requirements due to the complete absence of occluded gases. NICHROME V is particularly recommended when a more constant resistance at variable temperatures is specified.

ADVANCE* for winding precision resistors used in electric meters and laboratory testing devices. In finer sizes its negligible temperature co-efficient of resistance (±.00002) combined with high resistivity makes it the most desired alloy for this use.

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In addition to these we manufacture over 80 different electrical heat and corrosion-resistant alloys. If your resistance requirements are different tell us about them and depend on it . . . Driver-Harris will develop the alloy best suited to your specifications.

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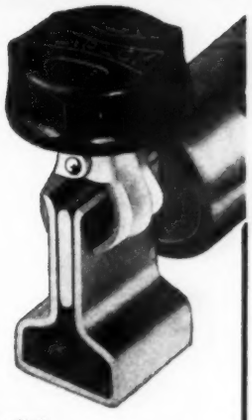
KLIPLOK CLAMPS FOR FUSE CLIPS



STOP . . .

- Premature fuse blowings.
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- Lost production.
- "Doubling up" of fuse links.
- Arcing and heating at contacts.
- Burnt fuses and clips.
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SAVE FUSES—CLIPS—POWER!

TRICO KLIPLOK CLAMPS supply the needed pressure for easy flow of current. Prevents unnecessary shutdowns, damaged equipment and wasted power. Hundreds of thousands in use. There's a size for every clip! Production and safety engineers insist upon KLIPLOKS for performance and safety. Easily and quickly installed! No effort — no tools — no danger!

TEST CLAMPS

These sturdy clamps carry heavy currents and "stay put" when attached. Used for temporary connections, motor and meter testing, jumpers, etc.

Write for Bulletin Do6

INSTALL KLIPLOK CLAMPS TODAY!

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BLACKBURN Hi-Strength CONNECTORS

☆ FIRST IN STRENGTH!

They're REINFORCED!

Shown at upper right is the nut and pressure bar of a BLACKBURN CONNECTOR. Small arrows indicate how this bar is reinforced on both sides. Like the tie rods on a bridge, these two reinforcements greatly strengthen the pressure bar, giving it maximum rigidity and enabling it to distribute the pressure over the entire length of the connection. Thus, the BLACKBURN reinforcing makes a strong connector still stronger, and reduces your maintenance costs! It pays to use a quality product.

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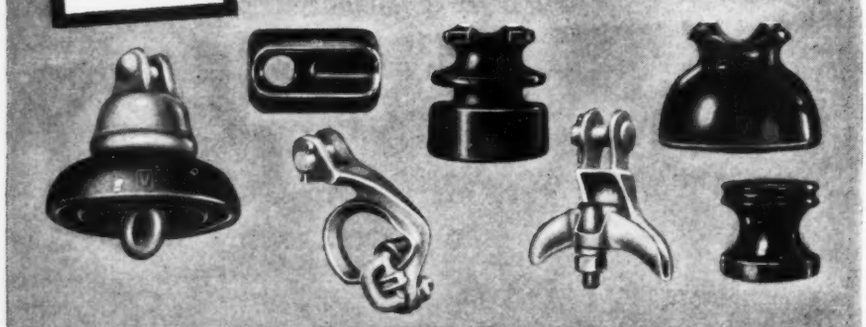
• High tension porcelain insulators made at Victor have passed the most severe tests on various types of installations during the past 50 years. For safety, long service and satisfaction in high voltage insulators, look to Victor.

THE MARK OF ENDURING SERVICE



SEND FOR FREE BOOK "A Story of Victor" tells how insulators are made. 24 pages. Write for a copy.

VICTOR INSULATORS, Inc.

VICTOR, NEW YORK

● HAROLD L. GERBER, chief inspector, department of electricity, San Francisco, since 1937, resigned from that position Oct. 21, to go into consulting electrical engineering practice associated with A. A. Coddington Co., San Francisco. Leaving the inspection field, he likewise resigned as secretary-treasurer of the Southwestern Section, International Association of Electrical Inspectors, which position he had held since the death of the late Claude Mitchell. Gerber began his electrical training with Pacific Gas and Electric Co. in the meter department, worked as a journeyman electrician and in 1923 became affiliated with the department of electricity as an inspector. In 1930, he took a leave of absence to enter private practice as consulting engineer but the depression caused him to give up the business and return to the department in 1932. He was made chief inspector Aug. 11, 1937. Although largely self-taught, Gerber is recognized as one of the keenest authorities on the National Electrical Code in the Pacific states.

● BERNARD F. WIESINGER has been appointed acting chief inspector department of electricity, San Francisco, by the department chief, Ralph Wiley, pending a civil service examination for the post. He has been an inspector for many years.

Deaths

● JOHN HICKOK, former district manager of Puget Sound Power & Light Co.'s Whatcom and Skagit county properties at Bellingham, Wash., died Sept. 29. He had retired in 1942 after 40 years with the company. Born in Ionia, Ia., July 27, 1873, Mr. Hickok worked with power companies at St. Paul, Portland, Vancouver, Wash., San Francisco and Honolulu. He had lived in Bellingham since 1902, first as railway superintendent for Puget Sound Power. He was made general superintendent of Puget Sound properties in Bellingham, in 1932 and in 1936 was advanced to manager.

● CLAUDE FOWLER, city electrical inspector of Fresno, died Sept. 25 of a heart attack. He has been the third city electrical inspector of Fresno to die within the past two years. He is succeeded by L. C. Sterling, acting inspector, who has been with the department for several years.

● ANDREW G. BETTS, 60, assistant superintendent of the Puget Sound Power & Light Co. in Thurston County at Olympia, Wash., died there Oct. 13. He began work for the company in Seattle in 1909, later moving to Tacoma and to Olympia in 1923.

TRADE notes

G-E Tells Plans for Oakland Factory

General Electric will manufacture fluorescent lamp ballasts in its 69th Ave. plant at Oakland, it was announced last month by John Hood, Oakland Works manager.

That Flamenol insulated wire and cable and Formex magnet wire will be made in the Oakland plant was made known last summer, when Ralph J. Cordiner, G-E vice-president, was in the West. Full-scale production on the wire is expected to get under way by early 1947.

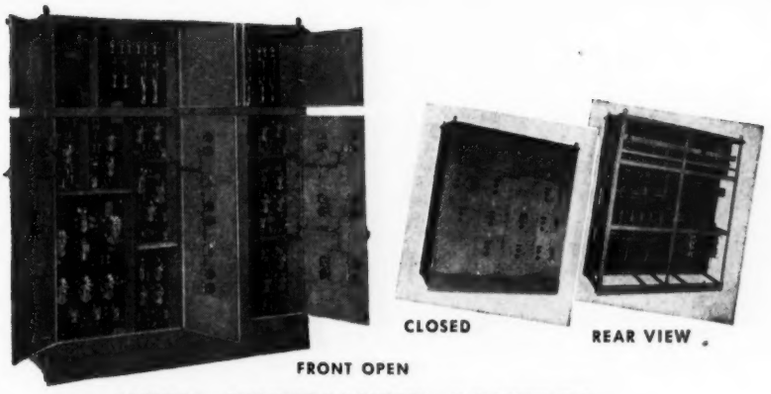
During the war, the plant was operated by the company, under contract with the Navy, for production of cable. CPA has authorized a $1,370,000 program at the plant to include: $191,000 for repairs and alterations, including an additional 100,000 sq. ft. of space; $527,000 for new equipment and machines for fluorescent ballast manufacture; $652,000 for new wire and cable producing equipment. In addition the company has offered to buy Navy-owned equipment now in the plant.

● APPOINTMENT of Lawrence L. Jones as superintendent of G-E's new Glyptal alkyd resins factory at Anaheim, Calif., was announced by Harry K. Collins, manager of the company's resin and insulation division. Jones had been at Schenectady. The Anaheim factory is expected to start production before the end of the year. It will comprise 35,000 sq. ft., including a process building, storage building, two pump houses and a boiler house.

● TRUMBULL Electric Mfg. Co., Pacific division, has received CPA approval for construction of a $40,000 addition to its plant at Seattle, Wash. The Austin Co. of Cleveland has designed and will build the 8,000-sq.-ft. one-story concrete and tile addition.

● JOHN MADDOX, representing the Mitchell Co. and the Railly Co., announces a recent change of address to Board of Trade Bldg., 444 Market St., San Francisco. He has added to his staff D. Thomas Young, illuminating engineer.

● COLLIER ELECTRIC Co., owned by J. Everett Collier, has moved from its old location to 700 W. 13th Ave., Denver, Colo.



WITH CENTRALIZED CONTROL
ONE MAN IN ONE PLACE CONTROLS EVERYTHING

Convenience and accessibility of controls are but two of the many potent arguments for centralized control. Here are a few of the advantages:—

SAFETY of dead front enclosure with operation of all mechanisms from the front offers greatest protection to your operator.

SIMPLICITY of installation and wiring results in reduced costs.

SPACE SAVING with the single enclosure is accomplished. Frameworks and wall supports are not needed.

ENGINEERED CONTROL to meet your own requirements at little or nothing above the final cost of individual control units.

These are but a few of the reasons why alert engineers are specifying centralized control for modern plant installations.

Let us show you the benefits. A Ward Leonard engineer will gladly help you to select a centralized control to meet your exact needs.

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RELAYS • RESISTORS • RHEOSTATS
Electric control devices since 1892

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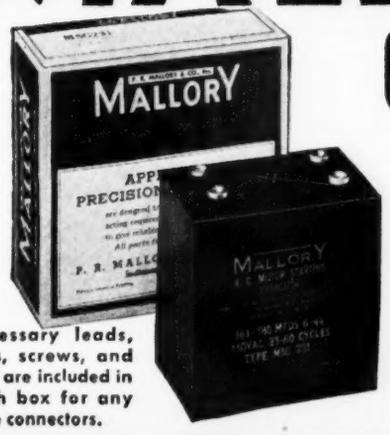
DEPEND ON—INSIST ON—
P.R. MALLORY & CO., Inc.
MALLORY
CAPACITORS



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Mallory MSG Capacitor:—Small, compact AC Motor Starting Capacitor that fits almost every mounting bracket or box. Replaces rectangular capacitors with leads, lugs or studs. Each capacitor is packed with complete set of universal mounting hardware and installation instructions.

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ARE YOU USING **BURNDY** CONNECTORS? FOR MANY YEARS **BURNDY** HAS SPECIALIZED IN THE PRODUCTION OF ELECTRICAL CONNECTORS FOR EVERY WIRE, CABLE AND BUS APPLICATION.

ARE YOU USING **MINERALLAC** JIFFY CLIPS AND HANGERS. JIFFY CLIPS ARE USED FOR HANGING PIPE, CONDUIT AND BX-CABLE, FOR MOUNTING COILS AND A GREAT VARIETY OF OTHER ADAPTATIONS. HANGERS HOLD THE CABLE IN PLACE WHILE CONDUIT IS BEING INSTALLED.

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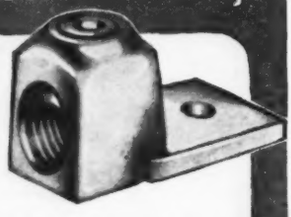
Conductor Fittings



Penn-Union offers all good types of terminals: Solderless lugs to grip the conductor by Bolt, Screw, Post-and-Nut, or Multi-Slit Tapered Sleeve; Vi-tite, E-Z, Shrink fit soldering lugs, etc.

Also Tee Connectors; Cable Taps; Straight, Elbow and Cross Connectors; Bus Supports; Grounding Clamps; Service Connectors, etc. *Penn-Union fittings are preferred by leading users*—because of their *Proven Dependability.*

PENN-UNION ELECTRIC CORP.
ERIE, PA.

PENN-UNION

Westinghouse Opens New Sacramento Headquarters

Westinghouse Supply Co. has opened new headquarters in Sacramento, Calif., at 14th and R streets, with Clark Baker Jr., former Sacramento representative, as branch manager. The new building comprises approximately 20,000 sq. ft. of floor space and includes offices, sales department, display rooms, repair facilities and warehouse. It is completely air conditioned and has modern fluorescent lighting.

Hosts at the opening on Oct. 18 were Baker, Charles R. Matthews, northern California district manager for the supply company, and Burrell S. Manuel of Los Angeles, vice-president. Some 500 electrical dealers, contractors and suppliers and utility men attended.

● RALPH JAMES, president of Northwestern Agencies Inc., announces that, after doing business for twelve years under individual proprietorship, the company has been incorporated with the following officers: president, Ralph James; vice-president, Stephen Kish, associated with James for the past eight years; secretary, Howard Tuttle, an attorney; treasurer, Marshall James, brother of the proprietor, recently returned from service in the U. S. Navy as radar and radio engineer. Marshall James will head the electronic division. Offices are at 4130 First Ave. South, Seattle 4, handling lines in Washington, Oregon, Idaho, Montana, British Columbia and Alaska.

● UTAH, Montana, California and Arizona cities were stopping points for the new Roebling plane on its maiden flight. The manufacturer recently purchased the five-passenger plane to aid in maintaining closer contact with customers, distributors and branch offices. On the initial trip were Charles R. Tyson, president; Ernest C. Low, vice-president in charge of sales; Charles M. Jones, vice-president in charge of public and industrial relations; Forest S. Burtch, manager of wire rope sales.

● GRAYBAR Electric Co. has moved to a new location at Fresno, Calif. and will maintain stocks there to supply the San Joaquin Valley. The new address is 101 S. Van Ness Ave., Fresno 2. Larry C. Johnson is manager, Charles G. Madwick, operating manager, Louis L. Fryer, merchandising salesman.

● WARD LEONARD ELECTRIC Co. has announced appointment of the L. F. Church Co., 750 Natoma St., San Francisco, as sales representative.

1000
ELECTRIC MOTOR DIAGRAMS AND TABLES

Electricians and Motor Repairmen
You will find this new book indispensable. Covers all types of circuits for D.C., Single, Two- and Three-Phase Motors. Hundreds of tables. Free literature. Price per copy, $7.25.

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ELECTRICAL PROJECT ENGINEER

One (1) experienced graduate engineer, responsible charge electrical engineering and design of steam-electric and hydro-electric power plants and high voltage substations. Applicants please furnish personal data and Experience Record.

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Increased Sales
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"A TORK CLOCK IS A FAMOUS NAME FOR TIME SWITCHES"

TORK CLOCKS
NOW WITH ASTRONOMIC DIALS

For all types of electrical switching and time control, Tork Time Clocks will control operations efficiently and automatically. Self-starting, all-electric. For minutes, hours, days or weeks. Special models designed to specifications.

Write for Bulletins
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WESTERN REPRESENTATIVES

George H. Curtiss, 222 29th St., Oakland 11, Calif. Veale Elec. Equip. Co., 445 E. 3rd Street, Los Angeles 13, Calif. Abbott Elec. Co., 1101 Eastlake Ave., Seattle 9, Wash. Stevens Sales Co., P. O. Box 2338, Salt Lake City 14, Utah. H. George Sheffer, P. O. Box 1587, Phoenix, Ariz.

... and to my grandson Wilmer, instructions to change oil in my transformers in 1996

Did YOU know about this transformer oil with an estimated 50-year life?

Oxidation has always been the nemesis of transformer oils — and the main reason why they had to be changed often. It causes the formation of impurities which interfere with the functioning of the transformer cooling system, and which damage insulating fabrics.

So it's great news that Shell now has Diala Oil 15 ready for you. Accelerated tests prove this oil resists oxidation 140 *times longer than the next best transformer oil;* which would mean, Diala Oil 15 can last 50 years in a transformer.

New Shell Diala Oil 15 also proved to have excellent thermal transfer properties and insulating value . . . low pour point . . . minimum volatility. And it's equally dependable for protecting oil-filled switches and oil-insulated cables.

When it's time to change — change to Shell Diala Oil 15.

SHELL DIALA OIL 15

SHELL

Shellengineered for the job

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PROFILES *of the month*

Above: W. H. Milton Jr. (left), administrator, and D. H. Lauder, works manager, of the G-E Nucleonics project at Hanford, Wash. G-E took over the government-owned plant in September and will carry on a program of nuclear research and development. Milton had been acting administrator for G-E at Hanford since May, and is assistant general manager of the company's chemical department. Lauder had been at Schenectady with G-E since 1942

Center: Daniel K Coyle, recently named sales manager of the Sacramento (Calif.) Municipal Utility District.

In the West for last month's IAEI meetings were (from left): L. B. McConaghy, NEMA portable cord division; James S. Mahan, representing Fustat manufacturers; A. S. Basil, chief engineer, wire and cable division, U. S. Rubber Co.

HORSEPOWER...*for the Future*

Horsepower, born of millions of tons of dams, water, steel towers and massive pieces of machinery, represents years of careful planning before it goes to work in factory, store and home.

Evidence of the importance of thought and foresight behind such major improvements is P. G. and E.'s recent announcement of its plan to spend $160,000,000 this year and through 1948, for expansion and new construction on its system.

Jobs? Thousands of them will be created in a wide variety of industries. Local business? Millions of dollars of benefit to local manufacturers, distributors and retailers. Power? New powerhouse construction will add over half a million horsepower to our system.

Northern California is on the gallop. More and more power will be needed by industrial, commercial and domestic users. And we're making sure that then, as now and in the past, Horsepower will have planned wisely to meet every requirement.

P·G·and E· PACIFIC GAS AND ELECTRIC COMPANY

EW—111-1146

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Cold cathode tubes, approx. 40 f. c. at tables.

FLATTERY... is the word for good restaurant lighting. Furnishings, dishes and table service sparkle in splendor and enchantment. Patrons appreciate the compliment thoughtful lighting pays to their appearance. Food—even the inelegant lobster—under the spell of softly diffused, adequate light, is revealed in its true color quality and becomes more tempting and appetizing. Restaurant lighting designed to build business, reputation and good will calls for technical knowledge of modern installation methods.

For advice or information consult your local utility's lighting engineers.